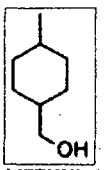
Patent 04915825 - Process for coal flotation using 4-methyl cyclohexane methanol frothers > Claims

- 1. In a froth flotation process wherein solid coal particles are selectively separated under coal froth flotation conditions as a froth phase from remaining solid feed particles as an aqueous phase in the presence of a frother, the improvement comprising a frother comprising a mixture of 4-methyl cyclohexane methanol, water, and a monoether of 4-methyl cyclohexane methanol.
- 6. In a froth flotation process wherein solid coal particles are selectively separated under coal froth flotation conditions as a froth phase from remaining solid feed particles as an aqueous phase in the presence of a frother, the improvement comprising a frother comprising a mixture of 4-methyl cyclohexane methanol, water, a monoether of 4-methyl cyclohexane methanol, a monoester of 4-methyl cyclohexane methanol, a monoaldehyde of 4-methyl cyclohexane methanol, and cyclohexane dimethanol.
- 12. In a froth flotation process wherein solid coal particles are selectively separated under coal froth flotation conditions as a froth phase from remaining solid feed particles as an aqueous phase in the presence of a frother, the improvement comprising a frother comprising a mixture of 4-methyl cyclohexane methanol, water, a monoether of 4-methyl cyclohexane methanol, dimethyl 1,4-cyclohexane dicarboxylate, cyclohexane methanol, 1,4-cyclohexane dimethanol, and alcohols.
- 17. In a froth flotation process wherein solid coal particles are selectively separated under coal froth flotation conditions as a froth phase from remaining solid feed particles as an aqueous phase in the presence of a frother, the improvement comprising a frother comprising a mixture of 4-methyl methyl cyclohexane methanol water, a monoether of 4-methyl cyclohexane methanol, dimethyl 1,4-cyclohexane dicarboxylate, 1,4-cyclohexane dimethanol, and alcohols.

18,000

4-METHYL-1-CYCLOHEXANEMETHANOL



4-METHYL-1-CYCLOHEXANEMETHANOL

CAS No.	**34885-03-5**
Chemical Name:	**4-METHYL-1-CYCLOHEXANEMETHANOL**
Synonyms:	4-Methylcyclohexanemethanol;(4-Methylcyclohexyl)Methanol;4-METHYL-1-CYCLOHEXANEMETHANOL;1-(hydroxymethyl)-4-methylcyclohexane;4-METHYL-1-CYCLOHEXANEMETHANOL 98+% GC;4-METHYL-1-CYCLOHEXANEMETHANOL, CIS- AND TRANS- MIXTURE
CBNumber:	CB8455037
Molecular Formula:	C8H16O
Formula Weight:	128.21
MOL File:	34885-03-5.mol

4-METHYL-1-CYCLOHEXANEMETHANOL Property

Safety

Risk Statements :	36/37/38
Safety Statements :	26-36/37/39

4-METHYL-1-CYCLOHEXANEMETHANOL Chemical Properties,Usage,Production

4-METHYL-1-CYCLOHEXANEMETHANOL Preparation Products And Raw materials

Raw materials

Preparation Products

4-METHYL-1-CYCLOHEXANEMETHANOL Suppliers Global(12)Suppliers CHINA 7

Supplier	Tel	Fax	Email	Country	ProdList	Advantage
J & K SCIENTIFIC LTD.	400-666-7788 +86-10-82848833	+86-10-82849933	jkinfo@jkchemical.com;market3@jkchemical.com	CHINA	67642	76
Meryer (Shanghai) Chemical Technology Co., Ltd.	+86-(0)21-61259100 (Shanghai) +86-(0)755-86170099(ShenZhen) +86-(0)10-62670440 (Beijing)	+86-(0)21-61259102 (Shanghai) +86-(0)755-86170066 (ShenZhen) +86-(0)10-62670790(Beijing)	sh@meryer.com; sz@meryer.com	CHINA	40414	62
TCI (Shanghai) Development Co., Ltd.	800-988-0390	021-67121385	sales@tcishanghai.com.cn	CHINA	21163	81
Energy Chemical	021-58432009 / 400-005-6266	021-58436166-800	info@energy-chemical.com	CHINA	44202	61
Nanjing Chemlin Chemical Co., Ltd	025-83697070 ;□□□□ 010-68547217. ; QQ 4009977050 ,2355504199 (□□□□); skype:chemlin1997;	+86-25-83453306	sales@chemlin.com.cn ;	CHINA	17897	64
TCI Japan	03-3668-0489	03-3668-0520	sales@tokyokasei.co.jp	JAPAN	21882	80
TCI Europe	+32 (0)3 735 07 00	+32 (0)3 735 07 01	sales@tcieurope.eu	Europe	21495	75
TCI AMERICA	+1-800-423-8616 / +1-503-283-1681	+1-888-520-1075 / +1-503-283-1987	sales@tciamerica.com	USA	21485	75

34885-03-5(4-METHYL-1-CYCLOHEXANEMETHANOL)Related Search:

Prednisone CORTISONE METHANDIENONE 17ALPHA-HYDROXYPROGESTERONE ETHYL 4-METHYL-2-CYCLOHEXANONE-1-CARBOXYLATE Prednisolone Diethyl succinosuccinate Testosterone propionate AURORA KA-477 1,4-Cyclohexanedicarboxylic acid 1,4-Cyclohexanedimethanol Cortisone acetate 2,5-dioxo-1,4-cyclohexanedicarboxylic acid dimethyl ester (-)-TRANS-MYRTANOL Testosterone 19-Norandrostenediol Dimethyl 1,4-cyclohexanedicarboxylate Ethisterone

4-METHYL-1-CYCLOHEXANEMETHANOL 34885-03-5 1-(hydroxymethyl)-4-methylcyclohexane 4-METHYL-1-CYCLOHEXANEMETHANOL, CIS - AND TRANS- MIXTURE 4-METHYL-1-CYCLOHEXANEMETHANOL 98+% GC 4-Methylcyclohexanemethanol (4-Methylcyclohexyl)Methanol

4α-Methylcyclohexane-1β-methanol

Suppliers

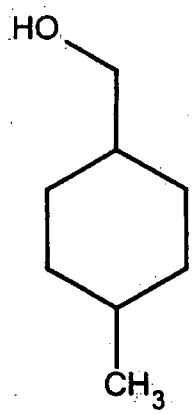
4α-Methylcyclohexane-1β-methanol Basic Information

Synonyms:(1α,4β)-1-Hydroxymethyl-4-methylcyclohexane;(1α,4β)-4-Methylcyclohexanemethanol;4α-Methylcyclohexane-1β-methanol

CAS Reference: 3937-49-3 (CAS DataBase Reference)

Molecular Formula: $C_8H_{16}O$

Molecular Weight: 0



Molecular Structure:

4α-Methylcyclohexane-1β-methanol Chemical Properties

History:

Analytical:

Find suppliers the easy way

Please post your buying leads,so that our qualified suppliers will soon contact you!

* Required Fields

CAS: 3937-49-3

* Purchase Request: 4α-Methylcyclohexane-1β-methanol

* Your email:

* Requirements:

Quantity:
Quality Standards:
Packing:
Place of Origin
Purity:
Standard:
Detailed Description:

-Enter between 20 to 2,000 characters English only Word count. 0 character(s)

Please tick the suppliers below to send inquiries. Or complete and post your buying offer of 4α-Methylcyclohexane-1β-methanol CAS number 3937-49-3 above with . your contact details. So that our qualified suppliers will send you quotations soonest.

Send RFQ
No Sign up Required

Related products

1β-[(Trimethylsilyl)oxy]-4β-methylcyclohexane 1β-[(Trimethylsilyl)oxy]-4β-methylcyclohexane	1β,4α-Diethoxycyclohexane 1β,4α-Diethoxycyclohexane	2-Methylcyclohexane-1-methanol 1-Hydroxymethyl-2-methylcyclohexane;2-
(1α,4α)-1-Hydroxymethyl-4-methylcyclohexane	4α-tert-Butylcyclohexane-1β-carbonitrile 4α-tert-Butylcyclohexane-1β-carbonitrile	1β-(Trimethylsilyl)oxy-4α-benzyloxycyclohexane 1α-(Trimethylsilyl)oxy-4β-benzyloxycyclohexane;1β-
1β-Isopropyl-4α-methyl-1α-cyclohexanol cis-p-Menthan-4-ol	α-Methyl-4α-phenylcyclohexane-1β-ethanamine MG-6681;α-Methyl-4α-phenylcyclohexane-1β-	Cyclohexane-1β,2α,3β,4α,5β-pentaol 2-Deoxy-myo-inositol;Cyclohexane-1β,2α,3β,4α,5β-
1β-Methyl-4α-(1-methylethenyl)cyclohexanol cis-β-Terpineol	Methylcyclohexane Methylcyclohexane-d14; methylcyclohexane absolute	(1β)-4α,7,7-Trimethylbicyclo[2.2.1]heptane-2β,3α-diol (1R,4S)-1β,7,7-Trimethylbicyclo[2.2.1]heptane-2β,3α-

Chemicals Index: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9

United States Patent [19]
Christie et al.

[11] **Patent Number: 4,915,825**
[45] **Date of Patent: Apr. 10, 1990**

[54] **PROCESS FOR COAL FLOTATION USING 4-METHYL CYCLOHEXANE METHANOL FROTHERS**

[75] Inventors: **Richard D. Christie, Millbrook; Anthony E. Gruss, St. Charles; Randall J. Fortin, Oswego, all of Ill.**

[73] Assignee: **Nalco Chemical Company, Naperville, Ill.**

[21] Appl. No.: **353,936**

[22] Filed: **May 19, 1989**

[51] Int. Cl.[4] **B03D 1/02**
[52] U.S. Cl. **209/166; 252/61**
[58] Field of Search **209/166, 167; 252/61**

[56] **References Cited**

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1,923,753	8/1933	Cunningham	209/166
4,166,887	9/1984	Gross	209/166
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538868	8/1987	U.S.S.R.	209/166
1045958	9/1982	U.S.S.R.	209/166
786711	4/1954	United Kingdom	209/166

OTHER PUBLICATIONS

"The Nalco Water Handbook", 2nd Edition, McGraw-Hill Book Co. (1988), pp. 9.15–9.20.
"The Nalco Water Handbook", 2nd Edition, McGraw-Hill Book Co. (1988), pp. 29.3–29.5.

Primary Examiner—David L. Lacey
Assistant Examiner—Thomas M. Lithgow
Attorney, Agent, or Firm—John G. Premo; Paul D. Greeley; Anthony L. Cupoli

[57] **ABSTRACT**

An improved froth flotation process wherein solid coal particles are selectively separated under coal froth flotation conditions as a froth phase from remaining solid feed particles as an aqueous phase in the presence of a frother, the improvement comprising a frother of at least 4-methyl cyclohexane methanol.

21 Claims, No Drawings

Patent No. US 04915825
Issue Date Apr 10, 1990
Claim this patent
Download PDF
Favorite

Case File Contents

GC/MS Identification

GC/MS Identification Scan

WO 1401010

West Virginia Chemical Leak

DAS R34313

Summary of Results / Project Information

MCHM runs

WV Spill/Elk River

2/3/14

WO#	Sample/ Material	Objective	Task	Done
1401010	Storage Tank Material	Characterize to fullest extent possible; Determine if Crude MCHM and Crude PPH are present; Identify any additional compounds (extra TICs); Where possible calibrate against MCHM and PPH standards.	Analyze by VOC	
			Analyze by SVOC	
			Analyze by Metals 200.7	
			Analyze by Anions 300.1	
			Analyze by Hg	
			Analyze by HPLC/UV	
			Analyze pH screen	
			Analyze % Water	
			Analyze by IR Screen	
		Comparison to Crude MCHM/Crude PPH – any other compounds present	SVOC	
	Crude MCHM	Determine DL	VOC	
			SVOC	
			GC/FID	
			HPLC/UV	
		Determine Composition (does it match MSDS)	SVOC	
	Crude PPH	Determine DL	VOC	
			SVOC	
			GC/FID	
			HPLC/UV screen	
		Holding Time Study – holding time of PPH compound in Hexane extract and compare to MSDS biodegrade 28 day HT.	GC/FID	
		Determine Composition (does it match MSDS)	SVOC	
	Tank 396 Material (250mL)	Characterize similar to Storage Tank material above except for Anions, Metals and Hg. Where possible calibrate using MCHM and PPH standards	Analyze by VOC	
			Analyze by SVOC	
			Analyze by HPLC/UV	
			Analyze pH screen	

			Analyze % Water	
		Comparison of TICs – compare Tank Material and Tank 396 material and identify any unmatched peaks.	SVOC	
1401014	Site Samples	Analyze for VOCs using target list and identify any TICs to determine presence of any MCHM or PPH material	Analyze by VOC	
		Analyze for SVOC using target list and MCHM & PPH standard to quantitatively determine concentration of MCHM or PPH present; identify TICs and determine which are related to Crude MCHM/PPH material and any other TICs.	Analyze by SVOC	
		Analyze qualitatively to determine presence of PPH compounds found in crude mixtures	Analyze by HPLC/UV screen	

Warner, Sue

From: Caporale, Cynthia
Sent: Monday, February 03, 2014 1:11 PM
To: R3 ESC-LB
Subject: FW: HOTSITE REPORT: Update - Freedom Industries, Charleston, WV

FYI

From: Burns, Francis
Sent: Monday, February 03, 2014 1:03 PM
To: R3 HOTSITES
Subject: HOTSITE REPORT: Update - Freedom Industries, Charleston, WV

OSC Matlock reported that the facility continues to manage surface and ground water seeping from the Site. A large amount of water has been pumped the past day (more than 100,000 gallons). The excess water has been due to steady rainfall combined with ice melt caused by warmer weather.

The booms deployed around the impacted shoreline of the facility were ripped free at approximately 6:00 AM on February 3, 2014. The ice flow and high water flowing down the Elk River caused the release of the booms. The booms were contained and tied off on the southern end of the shoreline. Work is ongoing to redeploy booms around the impacted shoreline.

The facility's remediation consultant, CEC, completed developing the monitoring wells for groundwater sampling. The monitor wells are scheduled for sampling February 4 through February 5. CEC also will submit to WVDEP a design for lining the northern end of the interceptor trench.

EPA will be shipping two samples to the Region 3 lab in Fort Meade today. One sample is water from the excavated pipe in the interceptor trench and the other sample is from a seep on the impacted slope.

Utilities along the Ohio River are no longer checking for the MCHM. On Jan.20, the Evansville, IN, water utility at Mile 791 monitored for MCHM and was unable to detect it.

WORK ORDER

Printed: 2/3/2014 1:29:45PM

1401010

U.S. EPA Region 3 - FOR INTERNAL USE ONLY

Client: OSWER - Emergency Response
Project: DAS R34313
Final Report Due: 02/14/2014

Project Manager: Cindy Caporale
Site Name: West Virginia Chemical Leak
Acct#:

Report To:
Client Project Manager: Dennis Matlock
Email: matlock.dennis@epa.gov
Phone: (304)280-7500
Fax: -

Project/WO Comments
Shipping 1/23/14
14 Day Unvalidated
21 Day Validated

Shelf
Analyst
EPA #3 Shelf 8B

Received By: John Curry
Date Received: 01/24/14 11:45
Temperature Samples Received at:
Custody Seals Yes
Containers Intact Yes
COC/Labels Agree Yes
Preservation Confirmed No
Received On Ice Yes
Radiation Checked Yes

Relinquished By: Gene Nance

ESAT INFO ONLY

Preliminary Report Due Date _____
ESAT Due Date _____
_____Complete _____Not Complete
_____Need TDF _____TDF #

Sample# 1401010-01
Sample Name: MCHM/PPH Mixture
Sample Type: SAM

Lab\Report Matrix Water\Waste
Date Sampled 01/23/14 12:30

Sample Logged In: 01/27/14 13:15
Sample Received: 01/24/14 11:45

GC/MS Identification Scan

Sampled By: Ex. 6 - Personal Privacy
Expires: 07/22/14 12:30
Analysis Comments: 1 Waste Liquid
Sample Comments:

Received

Sample# 1401010-02
Sample Name: Crude MCHM Batch # TP 11042986
Sample Type: SAM

Lab\Report Matrix Water\Water
Date Sampled 01/17/14 00:00

Sample Logged In: 02/03/14 13:15
Sample Received: 01/17/14 11:45

GC/MS Identification Scan

Sampled By:
Expires: 07/16/14 00:00
Analysis Comments: 1 Waste Liquid
Sample Comments:

Received

Sample# 1401010-03
Sample Name: Crude PPH
Sample Type: SAM

Lab\Report Matrix Water\Water
Date Sampled 01/29/14 11:55

Sample Logged In: 02/03/14 13:15
Sample Received: 01/30/14 11:45

Sampled By: Ex. 6 - Personal Privacy

GC/MS Identification Scan

Expires: 07/28/14 11:55

Received

Analysis Comments: 1 Waste Liquid

Sample Comments:

Sample# 1401010-04
Sample Name: MCHM Freedom Industies Tank #396
Sample Type: SAM

Lab\Report Matrix Water\Water
Date Sampled 01/29/14 11:55

Sample Logged In: 02/03/14 13:15
Sample Received: 01/30/14 11:45

Sampled By: Ex. 6 - Personal Privacy

GC/MS Identification Scan

Expires: 07/28/14 11:55

Received

Analysis Comments: 1 Waste Liquid

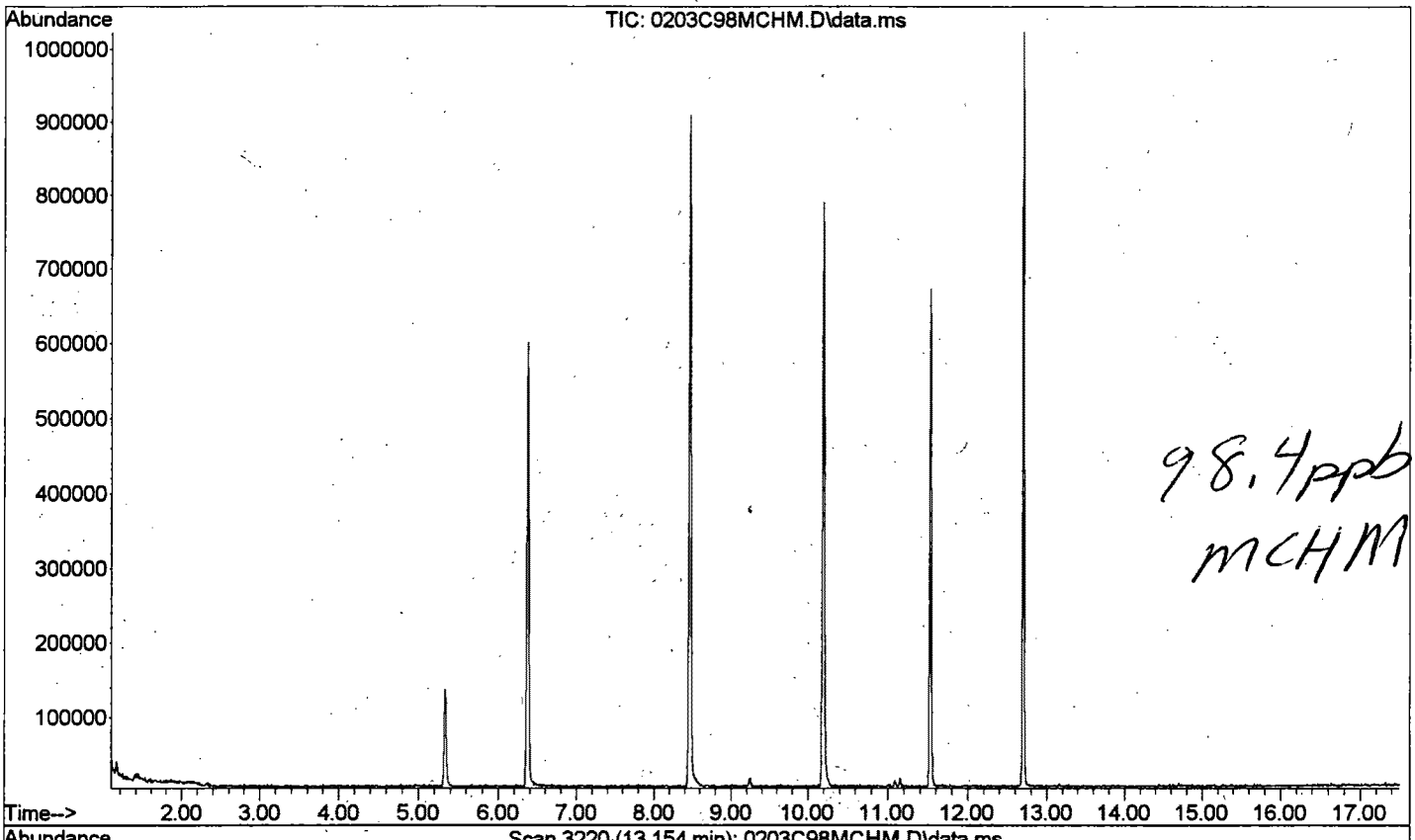
Sample Comments:

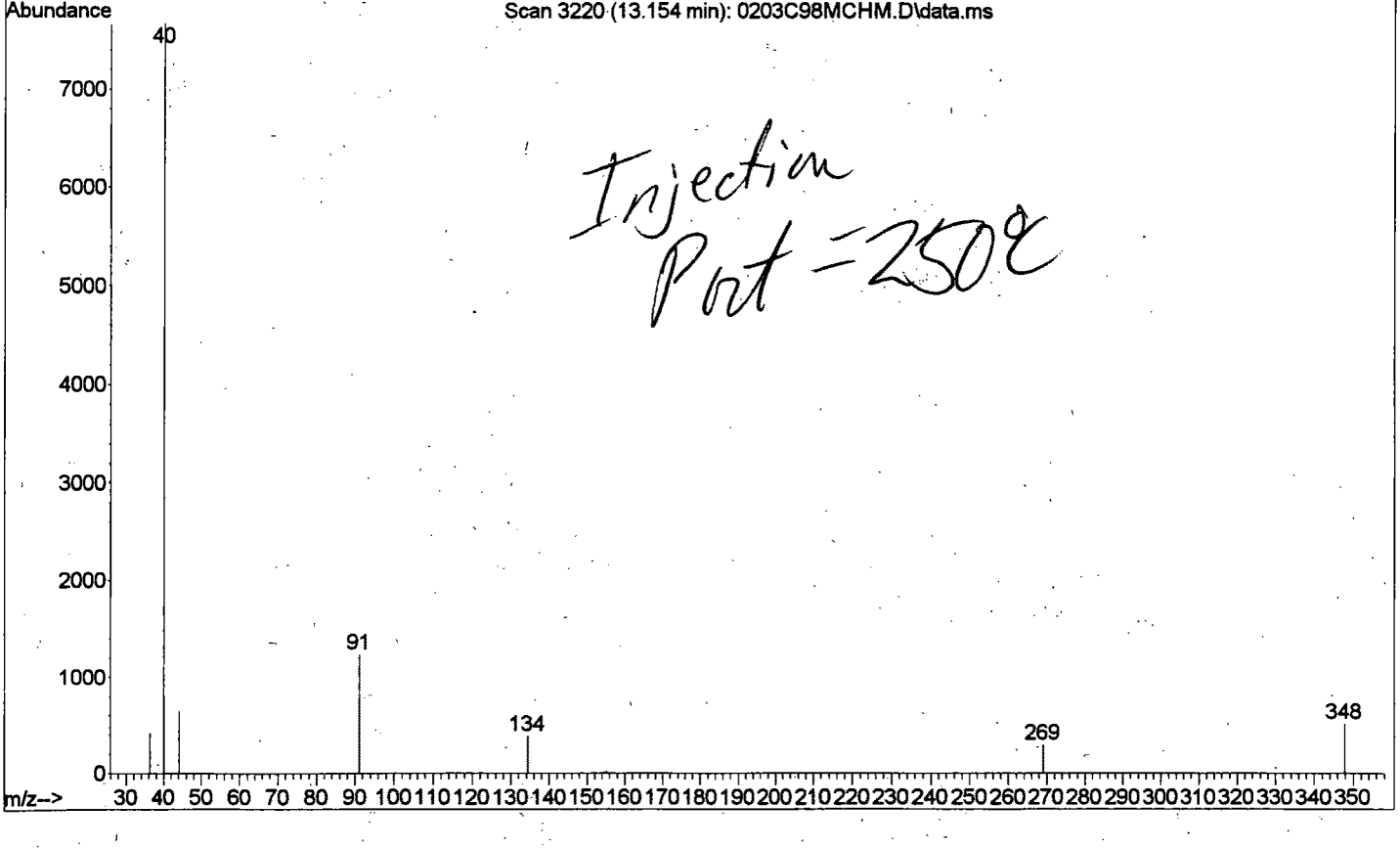
Analysis groups included in this work order

Corrosivity plus % water

Lab pH by SW846 9040C Percent Water by SW846 9001

File :D:\data\02032014\0203C98MCHM.D
Operator : SCW OBB-AG5975
Acquired : 3 Feb 2014 1:18 pm using AcqMethod ESC.M
Instrument : OBB-AG5975
Sample Name: 98 ppb, 100uL to 100 mL
Misc Info :
Vial Number: 1





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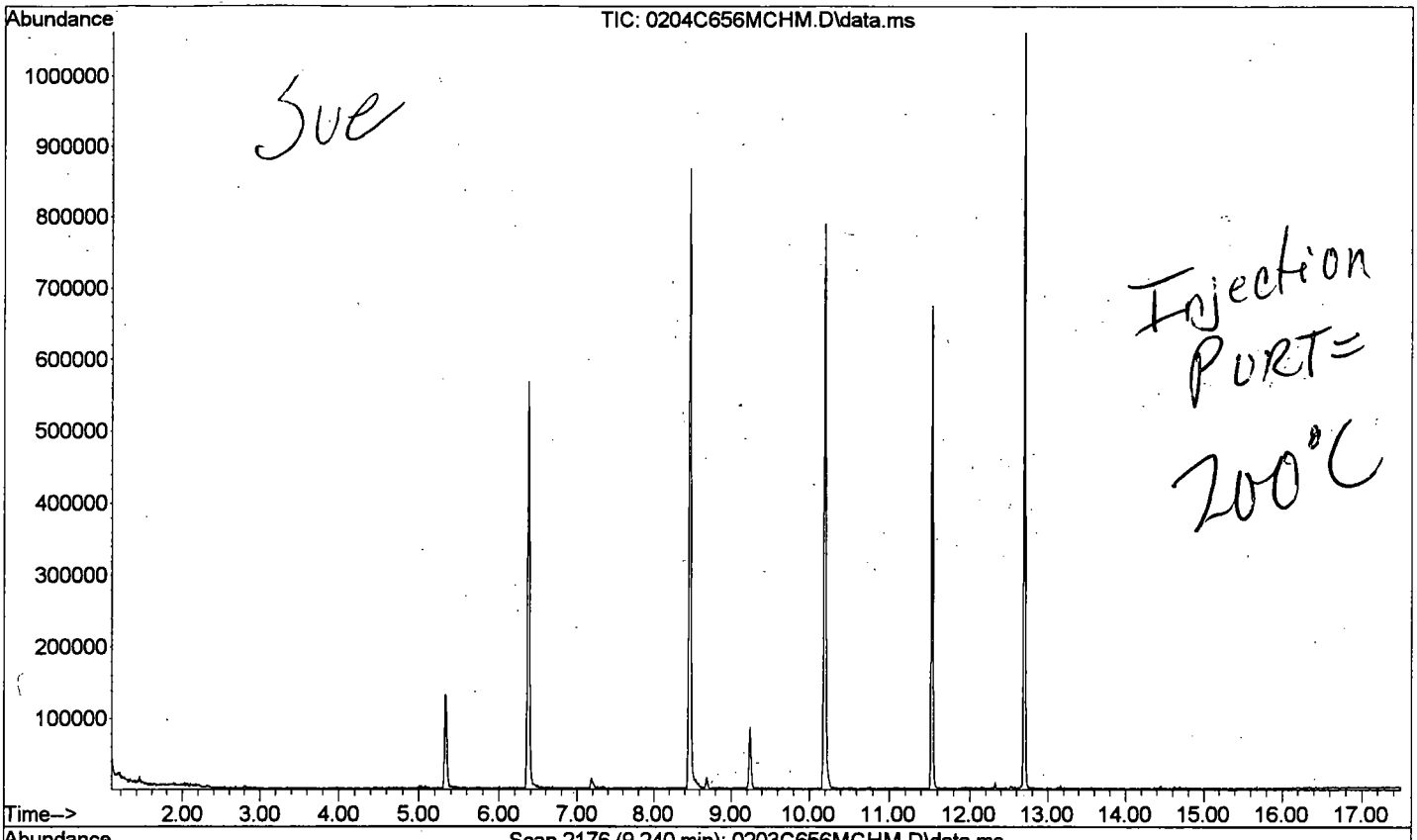
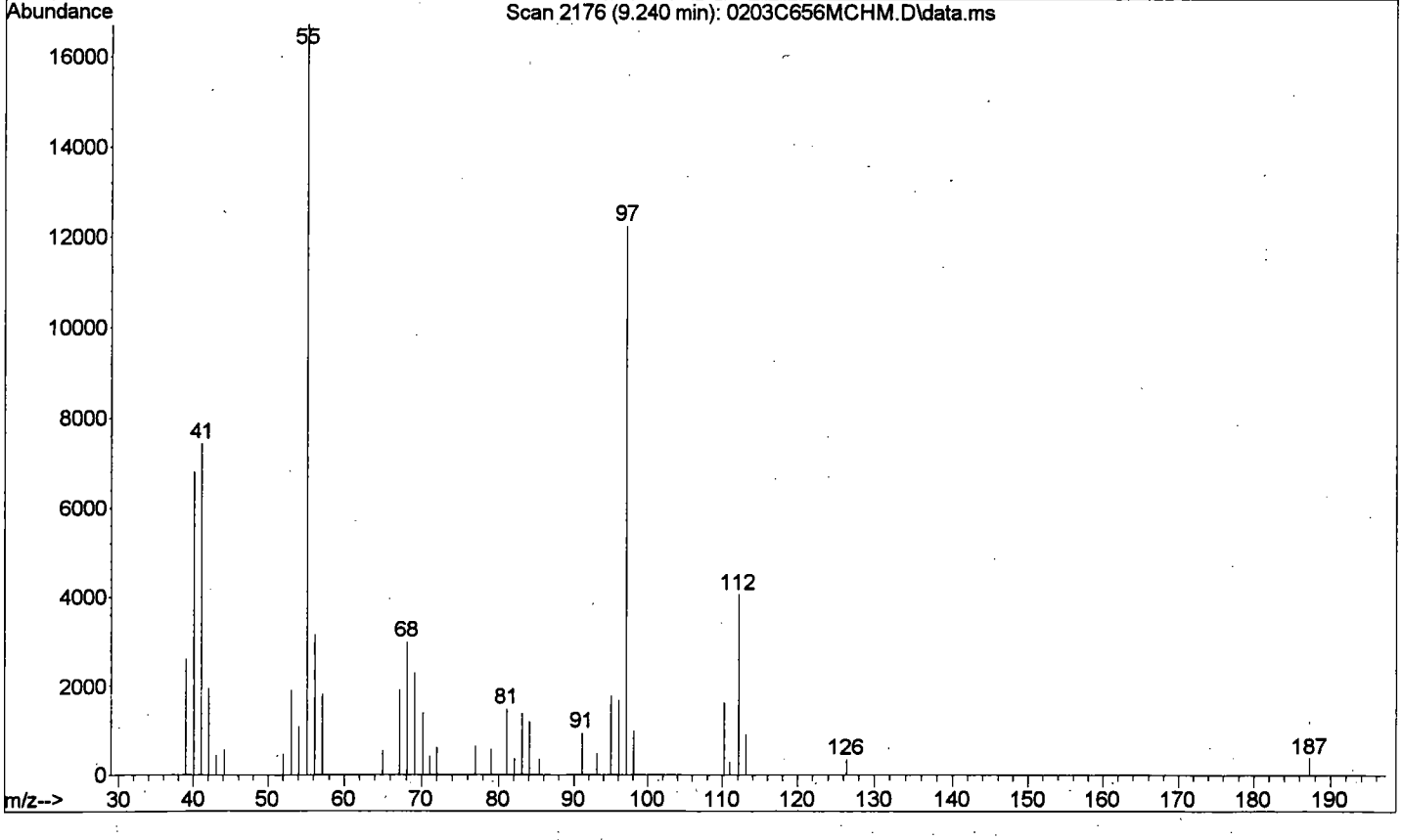
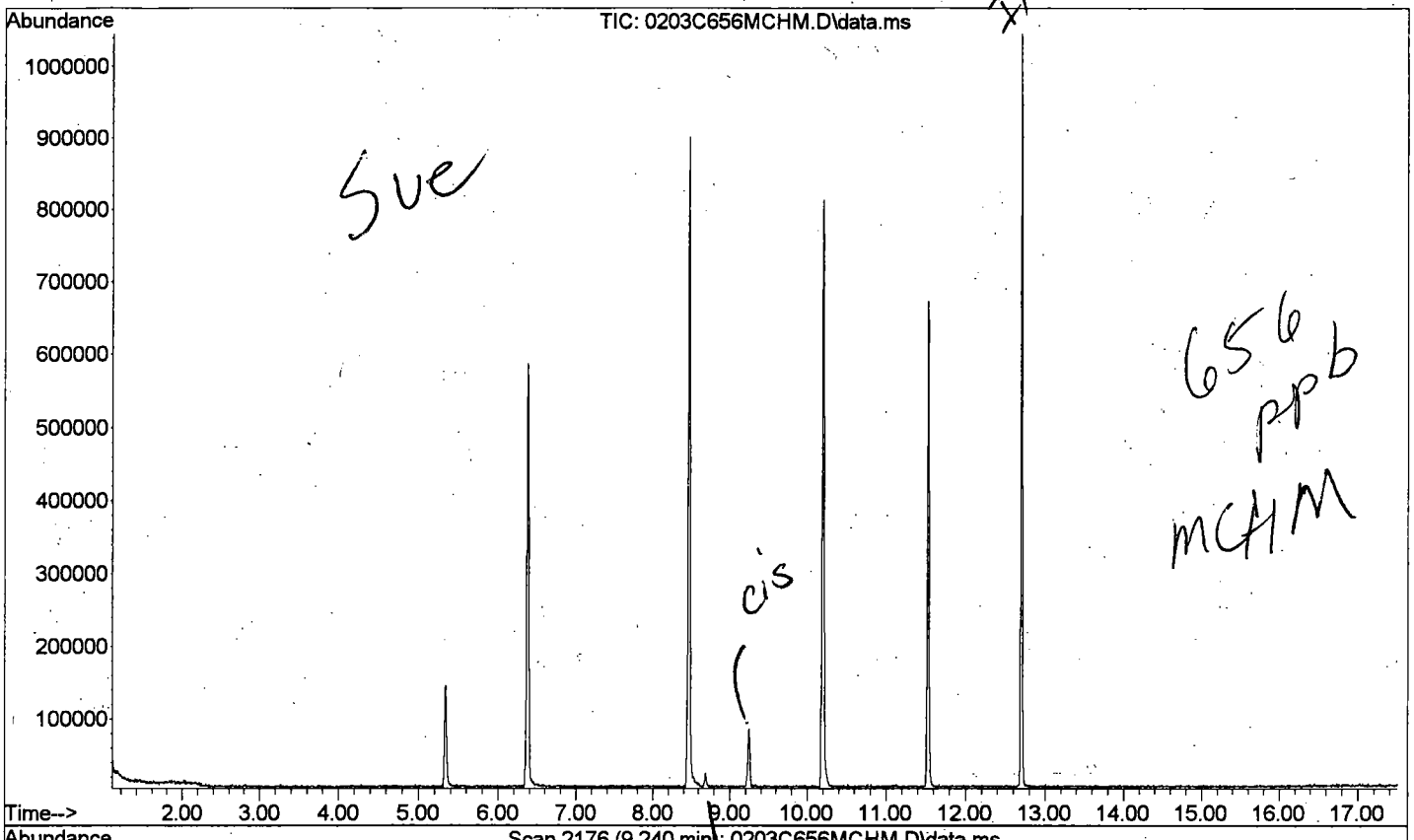
Operator : SCW OBB-AG5975
Acquired : 4 Feb 2014 9:05 am using AcqMethod ESC.M
Instrument : OBB-AG5975
Sample Name: 656ppb, 20uL to 100 mL
Misc Info :
Vial Number: 1

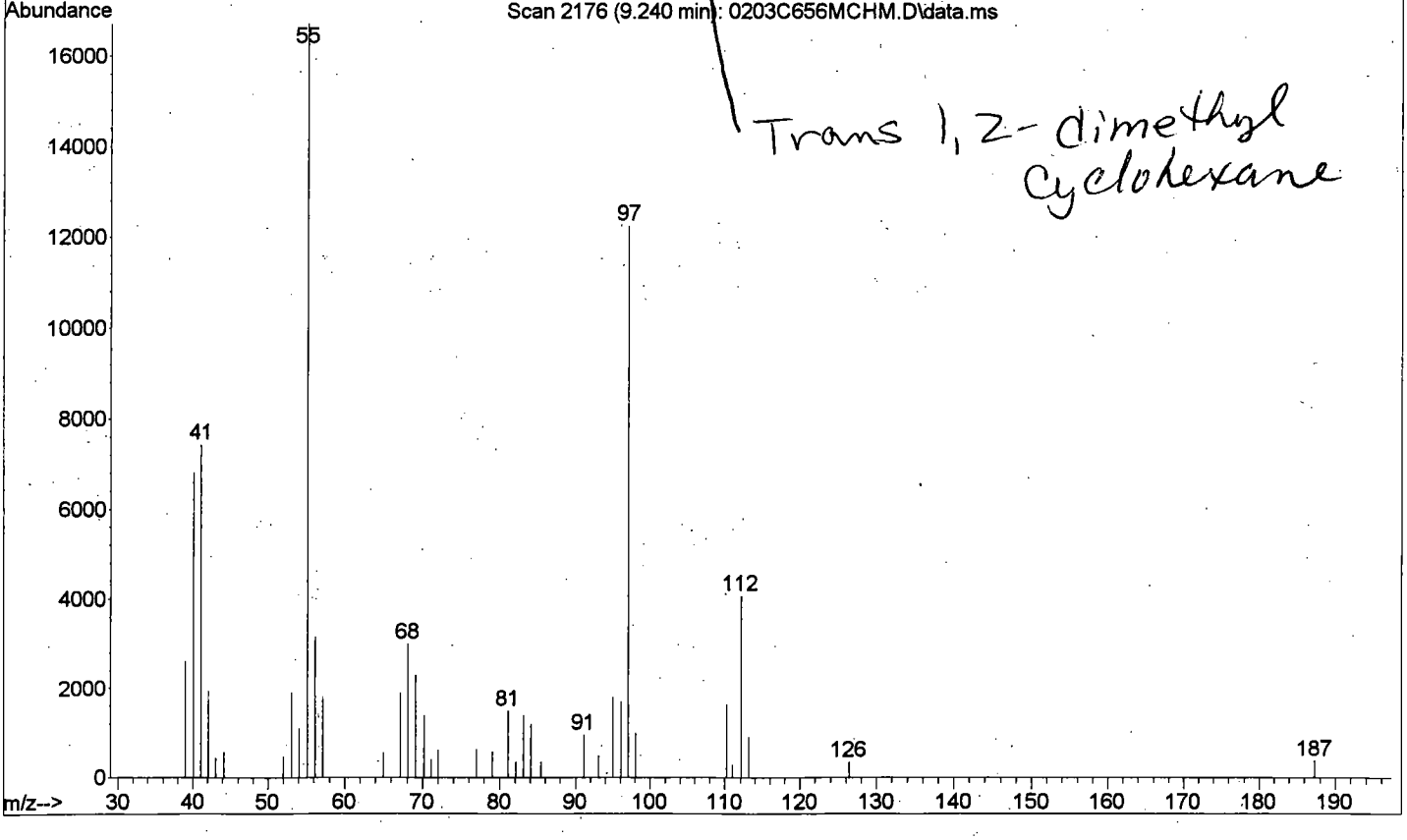




File :D:\data\02032014\0203C656MCHM.D
Operator : SCW OBB-AG5975
Acquired : 3 Feb 2014 3:55 pm using AcqMethod ESC.M
Instrument : OBB-AG5975
Sample Name: 656ppb, 20uL to 100 mL
Misc Info :
Vial Number: 1

20uL of 3280mg/L Stock in 100mL H_2O





Quantitation Report (QT Reviewed)

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Feb 03 17:19:30 2014
Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Thu Jan 30 13:30:19 2014
Response via : Initial Calibration

Compound		R.T.	QIon	Response	Conc	Units	Dev(Min)
Internal Standards							
1) 1,4-DIFLUOROBENZENE		6.525	114	159914	5.00	ug/L	0.00
37) CHLOROBENZENE-d5		10.334	117	154582	5.00	ug/L	0.00
56) 1,4-DICHLOROBENZENE-d4		12.808	152	69668	5.00	ug/L	0.00
System Monitoring Compounds							
23) 1,2-DICHLOROETHANE-d4		5.498	65	86446	5.16	ug/L	-0.01
Spiked Amount	5.000	Range 76 - 114		Recovery =	103.20%		
41) TOLUENE-d8		8.620	98	198426	4.98	ug/L	0.00
Spiked Amount	5.000	Range 88 - 110		Recovery =	99.60%		
59) 4-BROMOFLUOROBENZENE		11.646	95	74292	5.68	ug/L	0.00
Spiked Amount	5.000	Range 86 - 115		Recovery =	113.60%		
Target Compounds							Qvalue
52) M-XYLENE/P-XYLENE		10.907	106	1525	0.07	ug/L	# 15

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Feb 03 17:19:30 2014
Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
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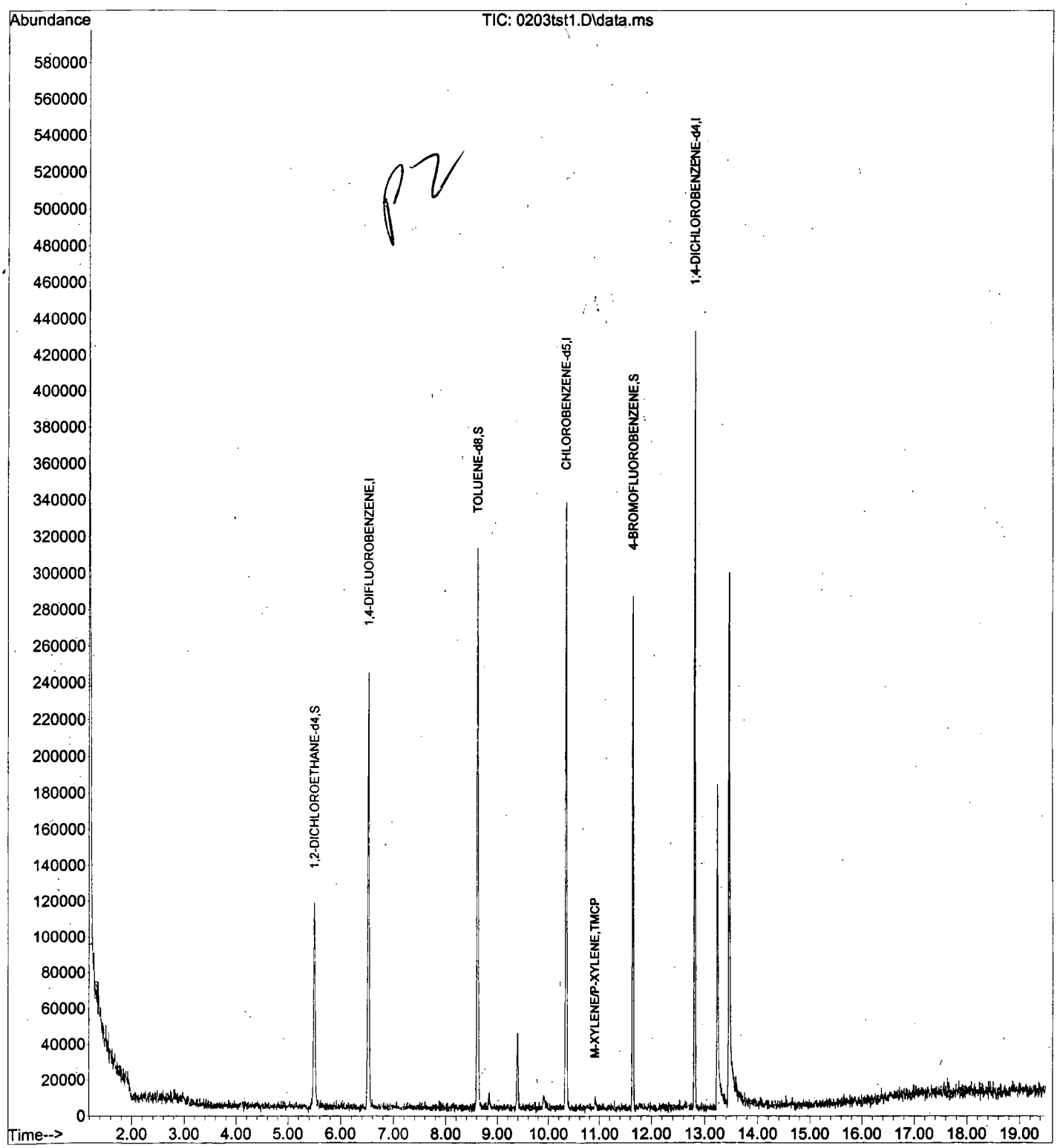
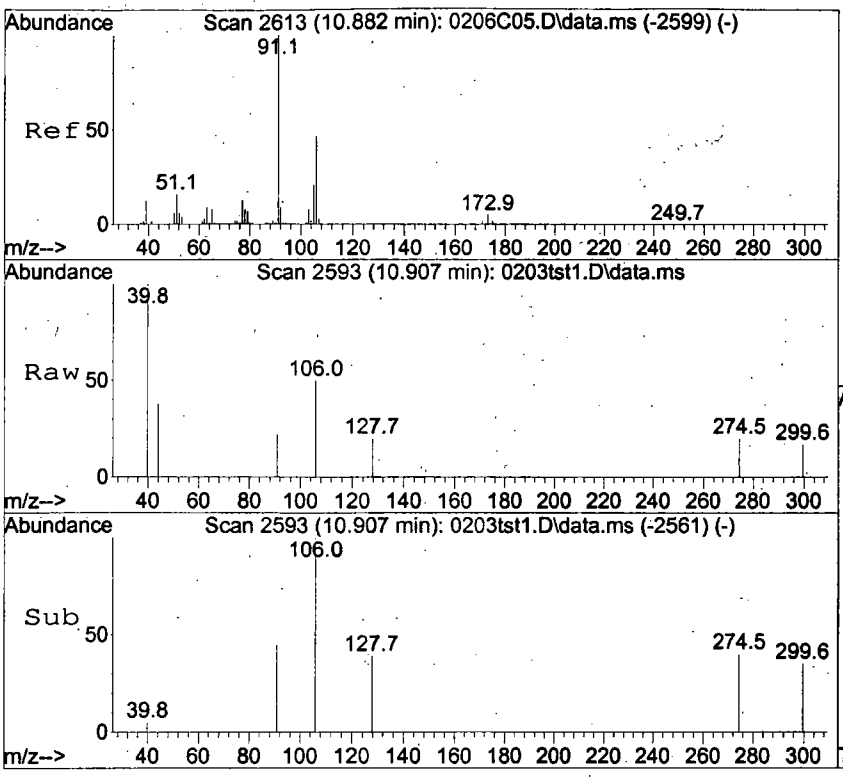
Response via : Initial Calibration



PZ



#52
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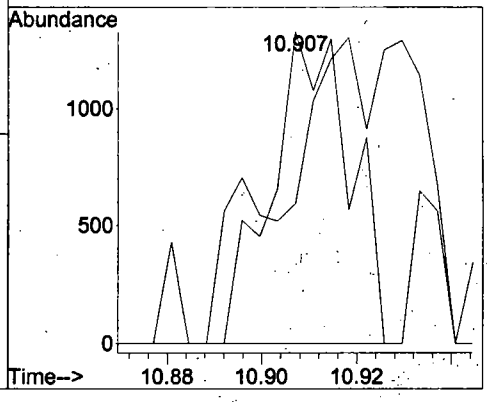
Concen: 0.07 ug/L
RT: 10.907 min Scan# 2593
Delta R.T. 0.019 min
Lab File: 0203tst1.D
Acq: 3 Feb 2014 16:59

Tgt Ion:106 Resp: 1525

Ion	Ratio	Lower	Upper
106	100		
91	74.5	164.8	247.2#



LSC Area Percent Report

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Integration Parameters: NORMAL.P
Integrator: RTE
Smoothing : ON Filtering: 5
Sampling : 1 Min Area: 1 % of largest Peak
Start Thrs: 0.2 Max Peaks: 95
Stop Thrs : 0 Peak Location: TOP

If leading or trailing edge < 100 prefer < Baseline drop else tangent >
Peak separation: 5

Method : D:\METHODS\L01302014.M
Title : VOA Purge and Trap LOW LEVEL Aqueous Method

Signal : TIC: 0203tst1.D\data.ms

peak #	R.T. min	first scan	max scan	last scan	PK TY	peak height	corr. area	corr. % max.	% of total
1	1.580	104	105	110	rBV	8773	8093	1.45%	0.212%
2	2.255	283	285	292	rVB	6762	5902	1.06%	0.155%
3	2.416	325	328	332	rBV3	5245	5655	1.02%	0.148%
4	2.484	342	346	350	rBV3	7419	6327	1.14%	0.166%
5	3.069	501	502	510	rVB2	6098	7095	1.27%	0.186%
6	3.777	684	691	696	rBV	4173	6409	1.15%	0.168%
7	4.043	761	762	769	rBV2	4437	5717	1.03%	0.150%
8	5.494	1139	1149	1163	rVV4	114279	232892	41.80%	6.115%
9	6.525	1411	1424	1437	rBV2	242220	434469	77.99%	11.407%
10	8.617	1970	1982	1995	rBV3	309162	557094	100.00%	14.627%
11	8.845	2035	2043	2049	rBV5	9735	15960	2.86%	0.419%
12	9.393	2179	2189	2196	rBV5	42732	69705	12.51%	1.830%
13	9.906	2318	2326	2328	rBV4	7861	11966	2.15%	0.314%
14	10.337	2429	2441	2453	rBV2	335318	538506	96.66%	14.139%
15	10.918	2588	2596	2602	rBV4	7052	10201	1.83%	0.268%
16	11.646	2781	2790	2800	rBV3	285515	377465	67.76%	9.911%
17	11.717	2804	2809	2813	rBV2	4345	5714	1.03%	0.150%
18	12.189	2931	2935	2940	rBV2	4372	6356	1.14%	0.167%
19	12.324	2969	2971	2977	rBV2	6140	7176	1.29%	0.188%
20	12.388	2983	2988	2994	rBV2	4485	6151	1.10%	0.161%
21	12.699	3065	3071	3075	rVB2	3427	5938	1.07%	0.156%
22	12.808	3089	3100	3109	rBV	430485	517689	92.93%	13.592%
23	13.235	3206	3214	3227	rBV4	182210	291428	52.31%	7.652%
24	13.456	3263	3273	3285	rBV	296129	489378	87.84%	12.849%
25	13.707	3336	3340	3344	rVB4	5849	6600	1.18%	0.173%
26	13.853	3378	3379	3384	rBV3	5157	5828	1.05%	0.153%
27	13.947	3398	3404	3408	rBV3	5048	5904	1.06%	0.155%
28	14.333	3500	3507	3511	rVB2	5319	8389	1.51%	0.220%
29	15.784	3891	3894	3898	rBV2	5958	6174	1.11%	0.162%
30	16.020	3953	3957	3962	rBV3	5444	7062	1.27%	0.185%
31	16.369	4044	4050	4056	rBV4	7627	8132	1.46%	0.214%
32	16.429	4061	4066	4068	rBV	5893	6572	1.18%	0.173%
33	16.845	4174	4177	4182	rBV3	6229	6122	1.10%	0.161%
34	17.182	4265	4267	4274	rVB5	7188	9323	1.67%	0.245%
35	17.325	4301	4305	4308	rVB5	7733	6226	1.12%	0.163%
36	17.422	4329	4331	4336	rBV6	7136	6726	1.21%	0.177%
37	17.557	4362	4367	4369	rBV3	6459	5928	1.06%	0.156%

LSC Area Percent Report

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Integration Parameters: NORMAL.P
Integrator: RTE
Smoothing : ON Filtering: 5
Sampling : 1 Min Area: 1 % of largest Peak
Start Thrs: 0.2 Max Peaks: 95
Stop Thrs : 0 Peak Location: TOP

If leading or trailing edge < 100 prefer < Baseline drop else tangent >
Peak separation: 5

Method : D:\METHODS\L01302014.M
Title : VOA Purge and Trap LOW LEVEL Aqueous Method

38	17.598	4375	4378	4382	rVB4	6819	6420	1.15%	0.169%
39	17.658	4391	4394	4397	rVB3	10199	7767	1.39%	0.204%
40	17.793	4427	4430	4437	rBV6	7731	8736	1.57%	0.229%
41	17.846	4442	4444	4449	rVB4	9807	8294	1.49%	0.218%
42	17.913	4459	4462	4465	rVB2	8226	5844	1.05%	0.153%
43	18.082	4503	4507	4512	rVB4	8406	8362	1.50%	0.220%
44	18.232	4545	4547	4552	rVB3	11127	8782	1.58%	0.231%
45	18.258	4552	4554	4558	rBV3	10103	8804	1.58%	0.231%
46	18.412	4594	4595	4599	rBV3	10223	7469	1.34%	0.196%
47	18.577	4636	4639	4643	rVB5	6631	6620	1.19%	0.174%
48	18.599	4643	4645	4649	rBV3	7129	7515	1.35%	0.197%
49	18.637	4651	4655	4656	rVB2	7755	5622	1.01%	0.148%
50	19.308	4831	4834	4837	rBV3	7160	6167	1.11%	0.162%

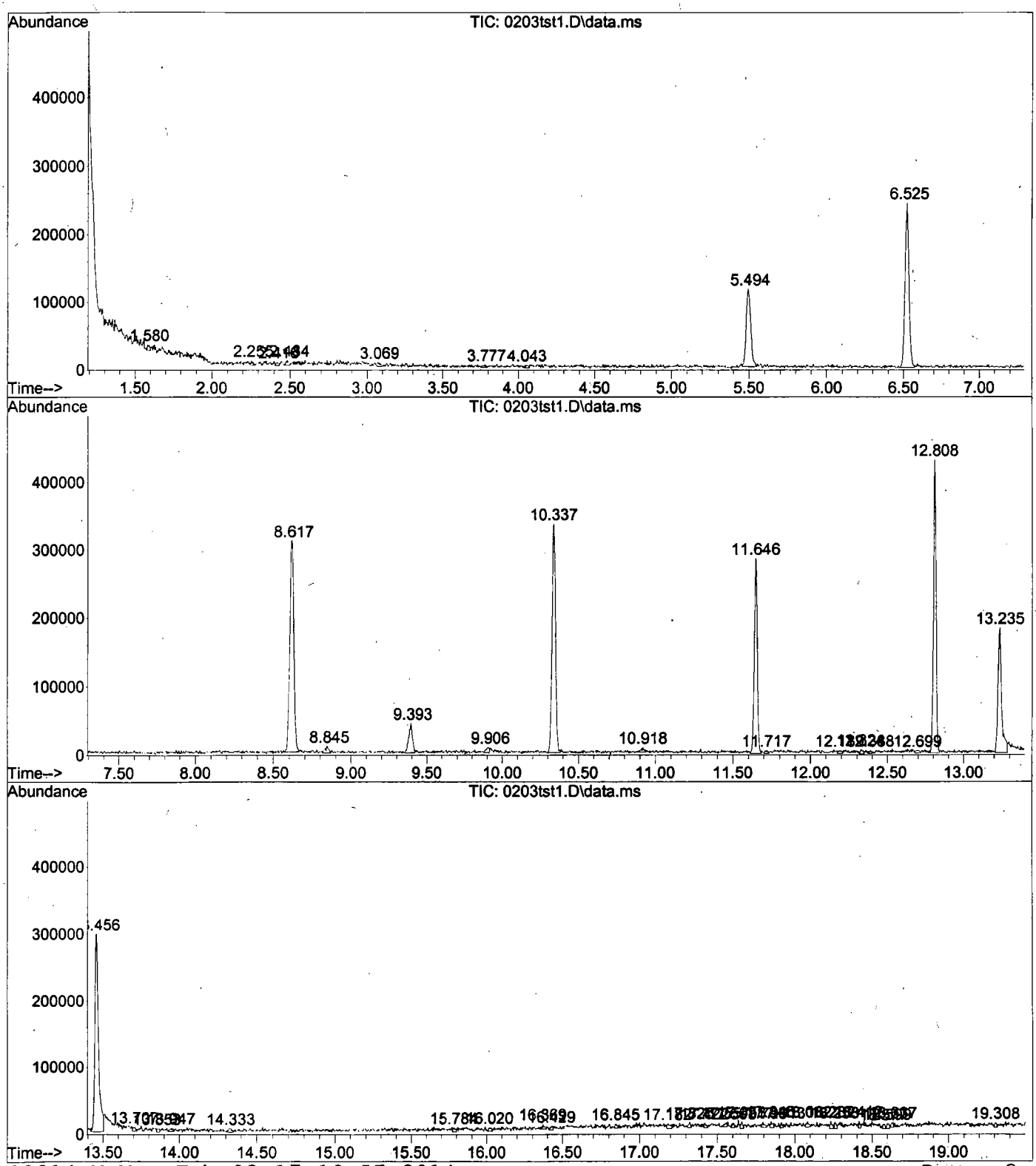
Sum of corrected areas: 3808674

LSC Report - Integrated Chromatogram

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P



Library Search Compound Report

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method

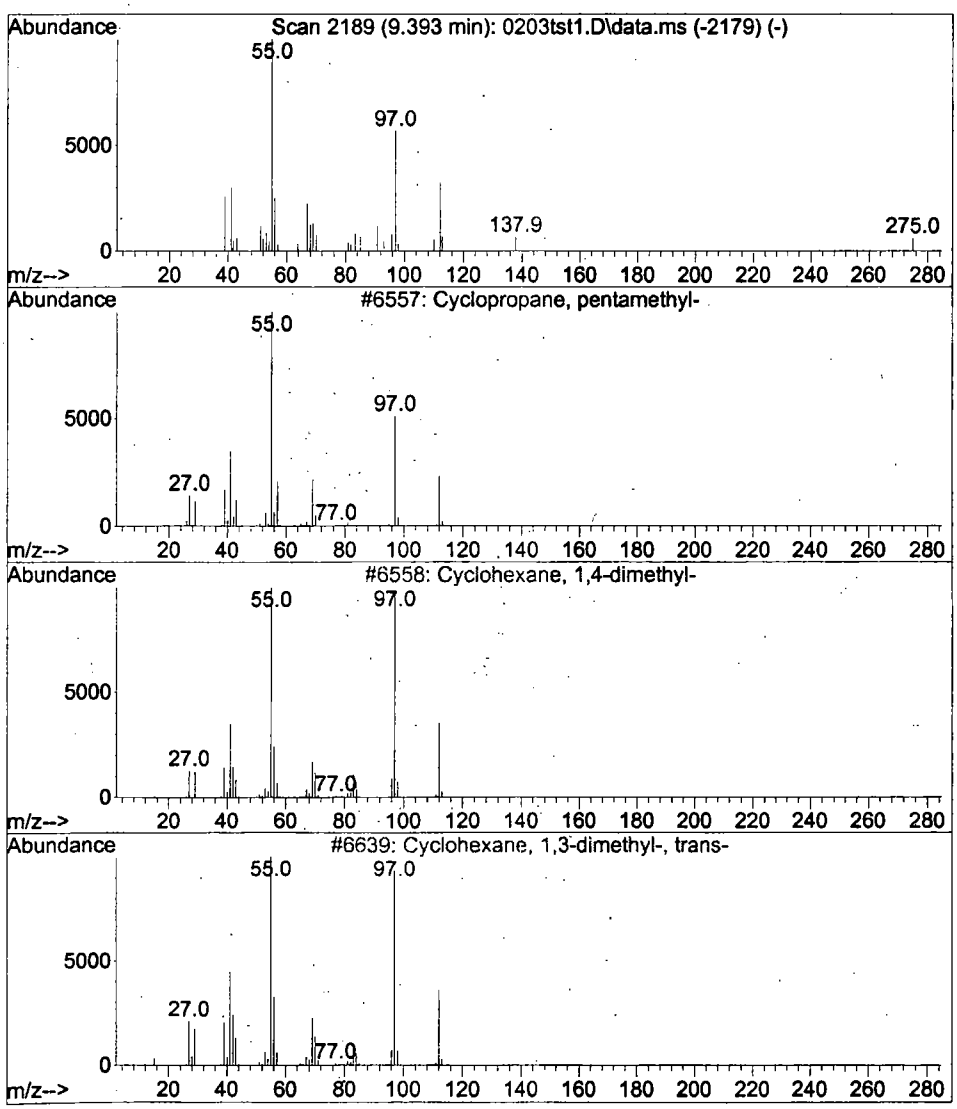
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

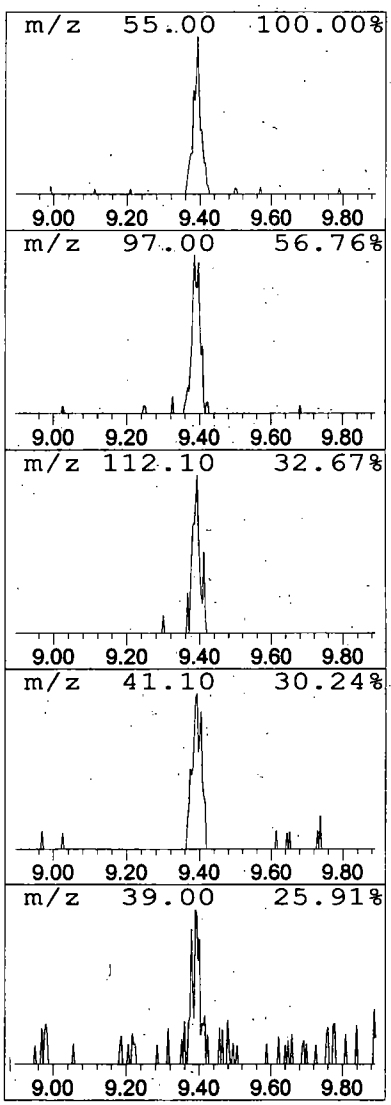
****

Peak Number 1 Cyclopropane, pentamethyl- Concentration Rank 3

R.T.	EstConc	Area	Relative to ISTD	R.T.
9.393	0.65 ug/L	69705	CHLOROBENZENE-d5	10.334

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Cyclopropane, pentamethyl-	112	C8H16	014172-83-9	52
2	Cyclohexane, 1,4-dimethyl-	112	C8H16	000589-90-2	50
3	Cyclohexane, 1,3-dimethyl-, trans-	112	C8H16	002207-03-6	47
4	Cyclohexane, 1,2-dimethyl-, cis-	112	C8H16	002207-01-4	45
5	Cyclohexane, 1-bromo-2-methyl-	176	C7H13Br	006294-39-9	43





Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method

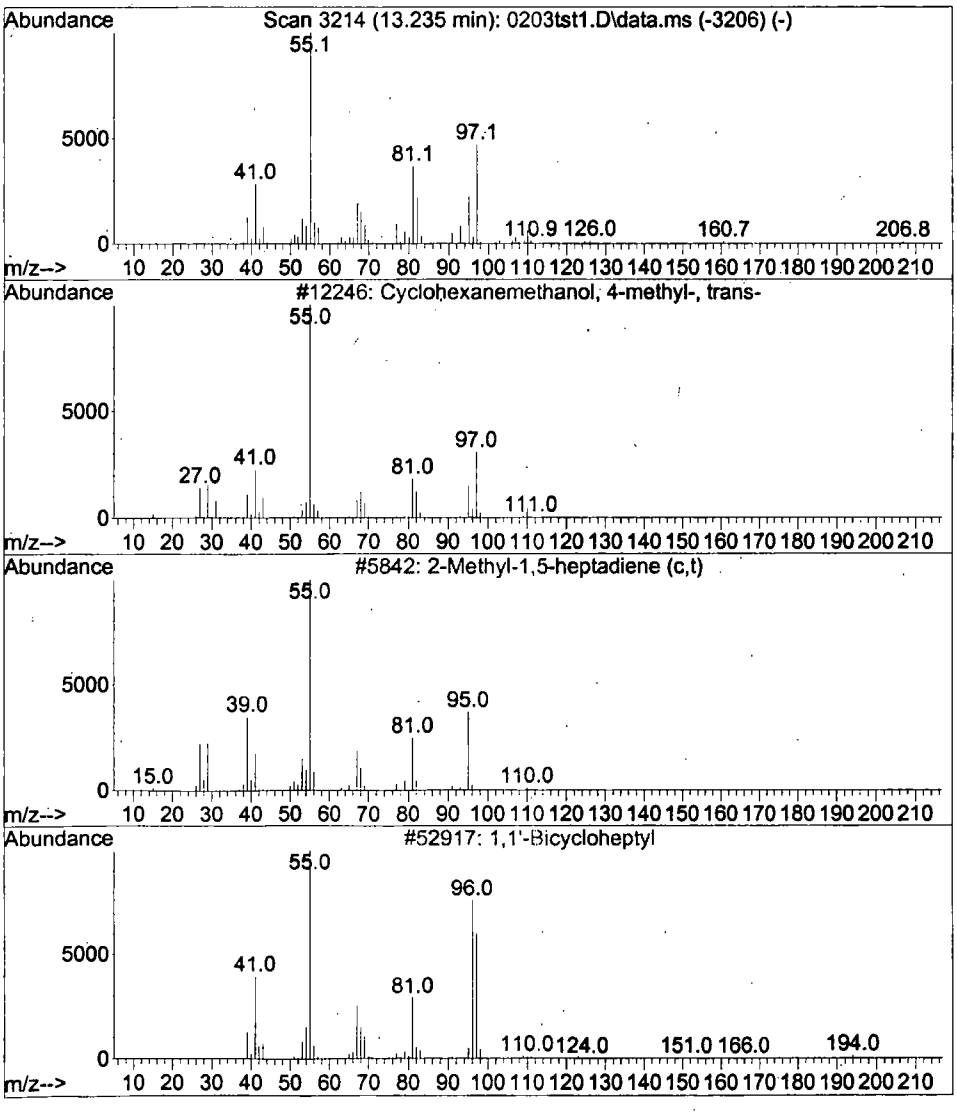
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

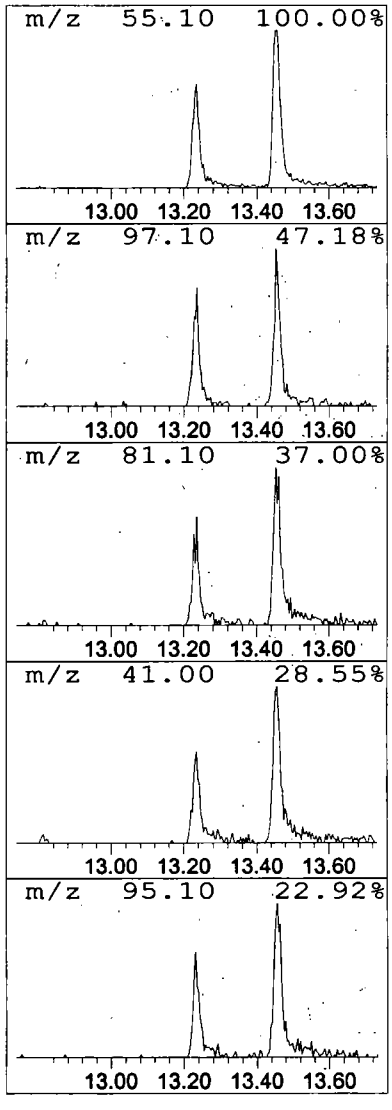
****

Peak Number 2 Cyclohexanemethanol, 4-meth... Concentration Rank 2

R.T.	EstConc	Area	Relative to ISTD	R.T.
13.235	2.81 ug/L	291428	1,4-DICHLOROBENZENE-d4	12.808

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Cyclohexanemethanol, 4-methyl-, ...	128	C8H16O	003937-49-3	72
2	2-Methyl-1,5-heptadiene (c,t)	110	C8H14	006766-54-7	38
3	1,1'-Bicycloheptyl	194	C14H26	023183-11-1	38
4	1,5-Heptadiene, 2-methyl-, (Z)-	110	C8H14	041044-64-8	38
5	Cycloheptane, bromo-	176	C7H13Br	002404-35-5	37





Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method

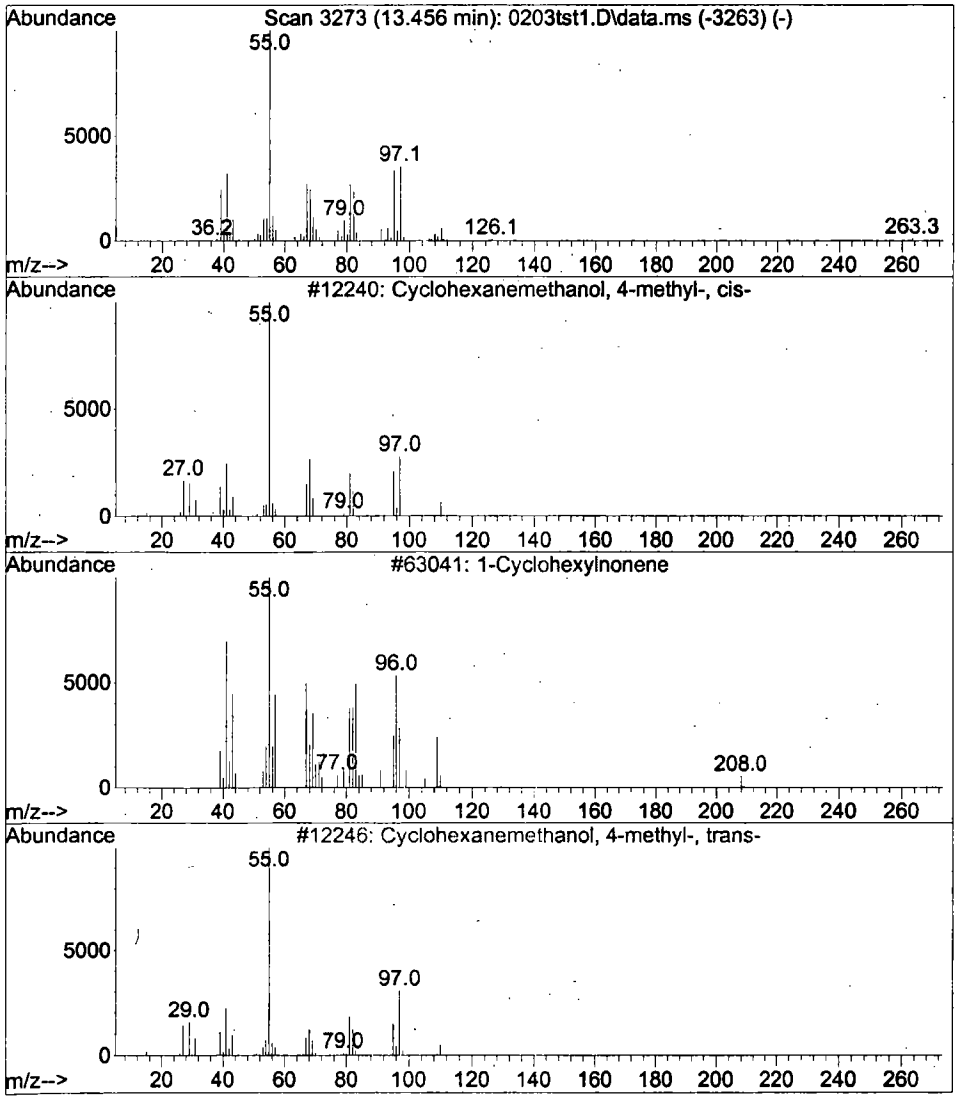
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

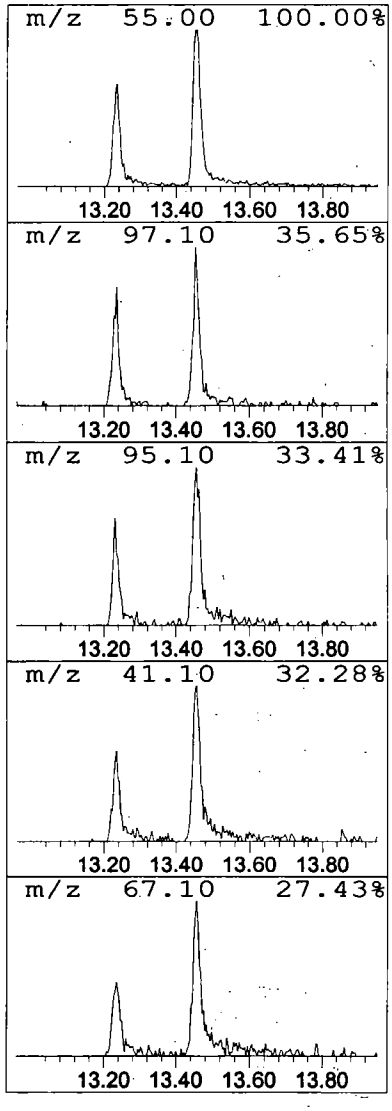
****

Peak Number 3 Cyclohexanemethanol, 4-meth... Concentration Rank 1

R.T.	EstConc	Area	Relative to ISTD	R.T.
13.456	4.73 ug/L	489378	1,4-DICHLOROBENZENE-d4	12.808

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Cyclohexanemethanol, 4-methyl-, ...	128	C8H16O	003937-48-2	53
2	1-Cyclohexylnonene	208	C15H28	114614-84-5	50
3	Cyclohexanemethanol, 4-methyl-, ...	128	C8H16O	003937-49-3	47
4	(5Z)-3-Methyl-1,5-heptadiene	110	C8H14	050763-51-4	43
5	1,5-Hexadiene, 2,4-dimethyl-	110	C8H14	068701-71-3	38





Tentatively Identified Compound (LSC) summary

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method

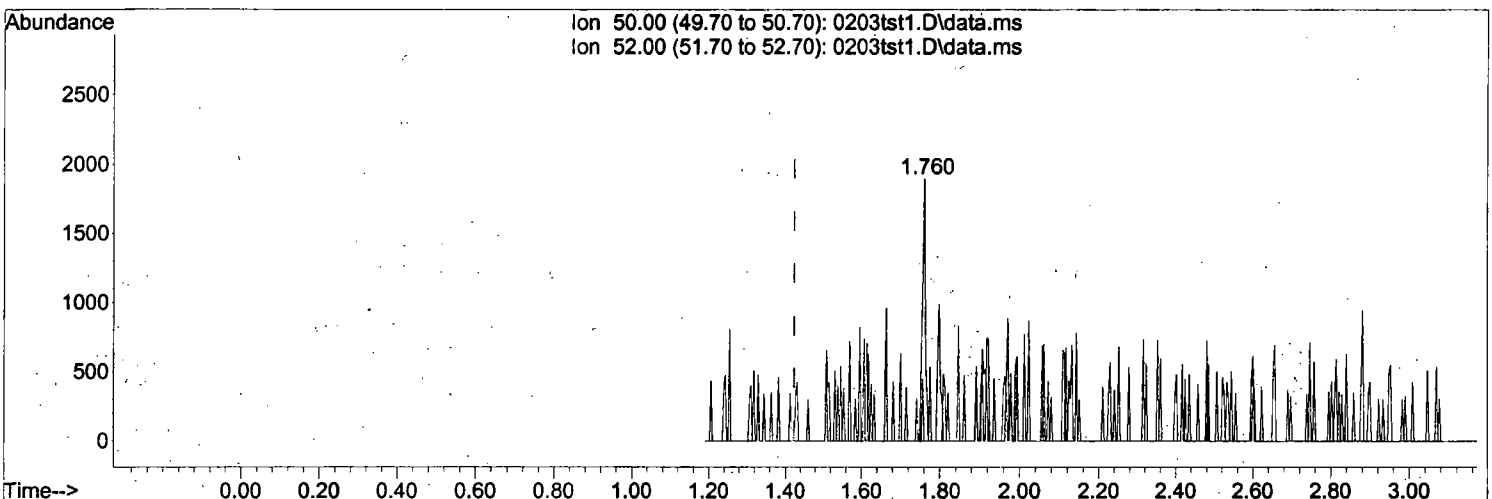
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

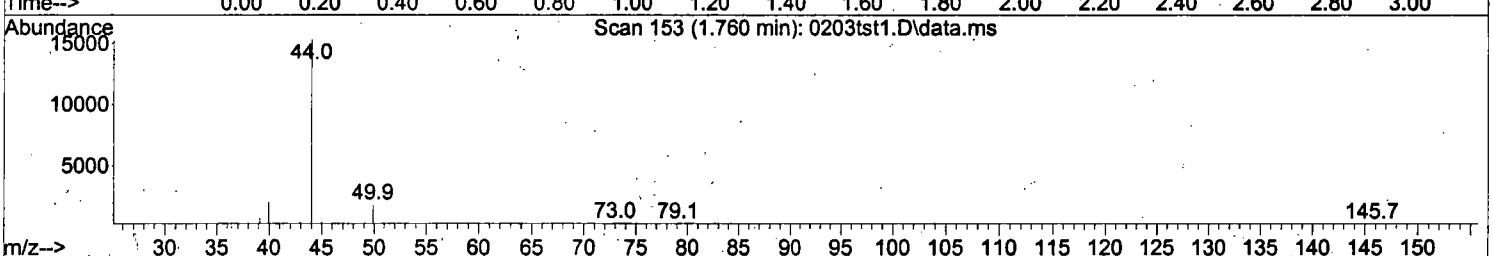
					--Internal Standard---			
TIC Top Hit name	RT	EstConc	Units	Response	#	RT	Resp	Conc
Cyclopropane, p...	9.393	0.6	ug/L	69705	2	10.334	538506	5.0
Cyclohexanemeth...	13.235	2.8	ug/L	291428	3	12.808	517689	5.0
Cyclohexanemeth...	13.456	4.7	ug/L	489378	3	12.808	517689	5.0

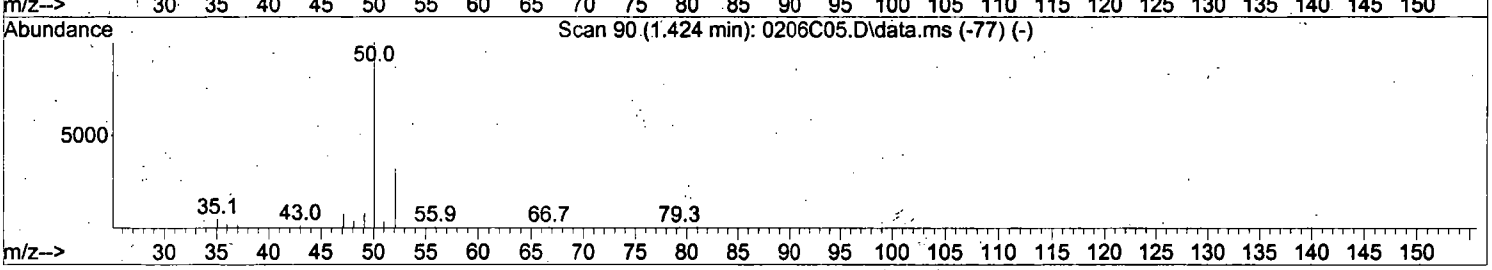
Quantitation Report (Qedit)

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Feb 03 17:19:14 2014
Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Thu Jan 30 13:30:19 2014
Response via : Initial Calibration







TIC: 0203tst1.D\data.ms

(3) CHLOROMETHANE (TMCP)

1.760min (+0.337) 0.07 ug/L

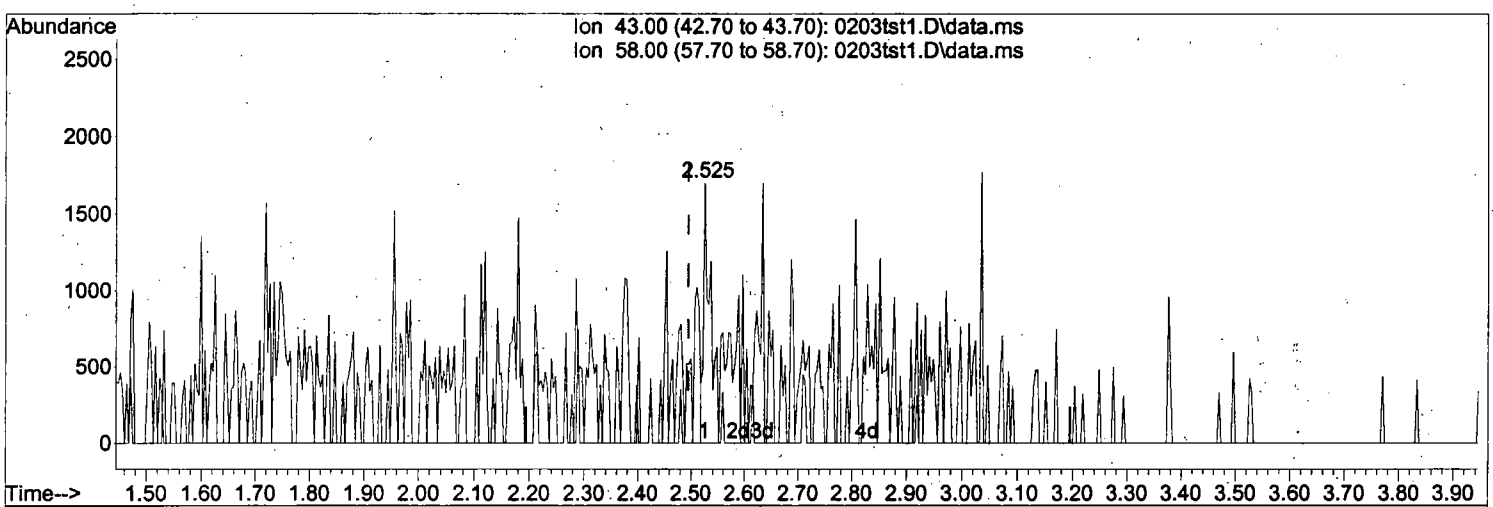
response 1159

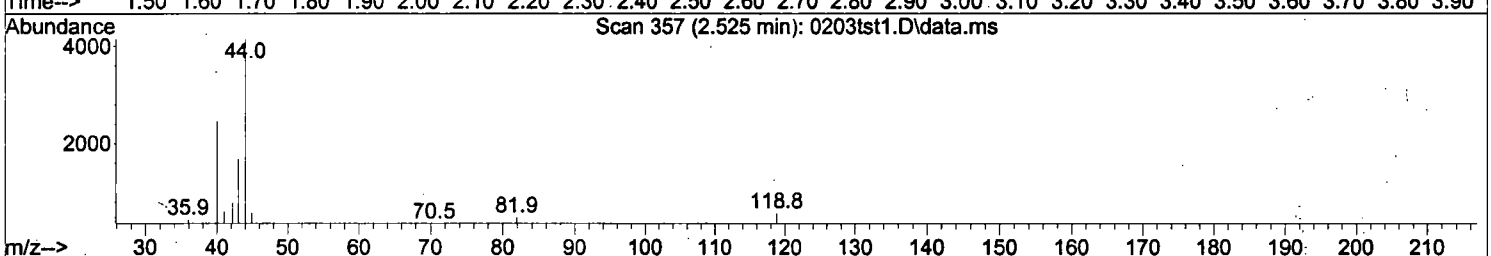
Ion	Exp%	Act%
50.00	100	100
52.00	31.20	43.23#
0.00	0.00	0.00
0.00	0.00	0.00

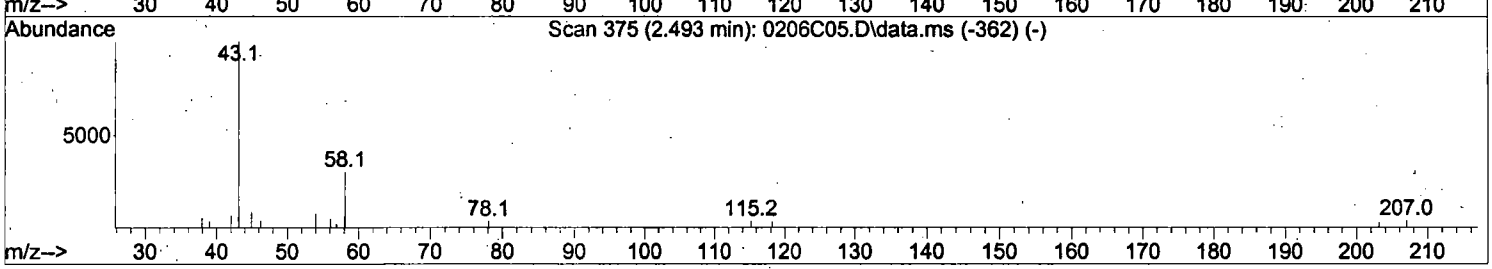
Quantitation Report (Qedit)

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Feb 03 17:19:14 2014
Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Thu Jan 30 13:30:19 2014
Response via : Initial Calibration







TIC: 0203tst1.D\data.ms

(8) ACETONE (TMCP)

2.525min (+0.030) 0.20 ug/L

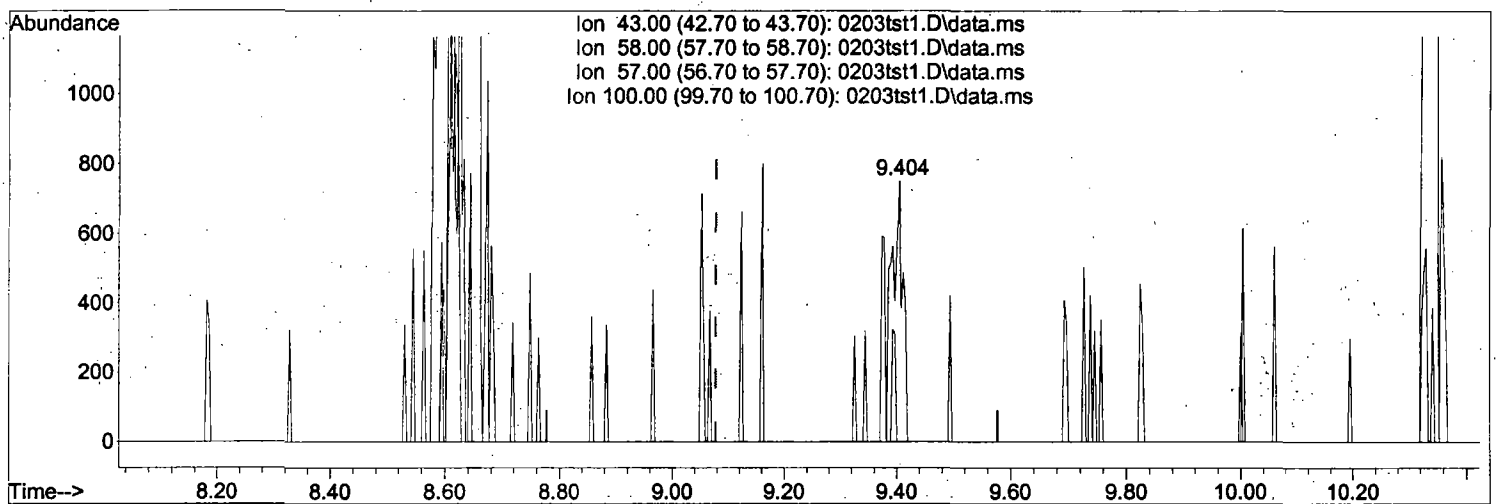
response 1516

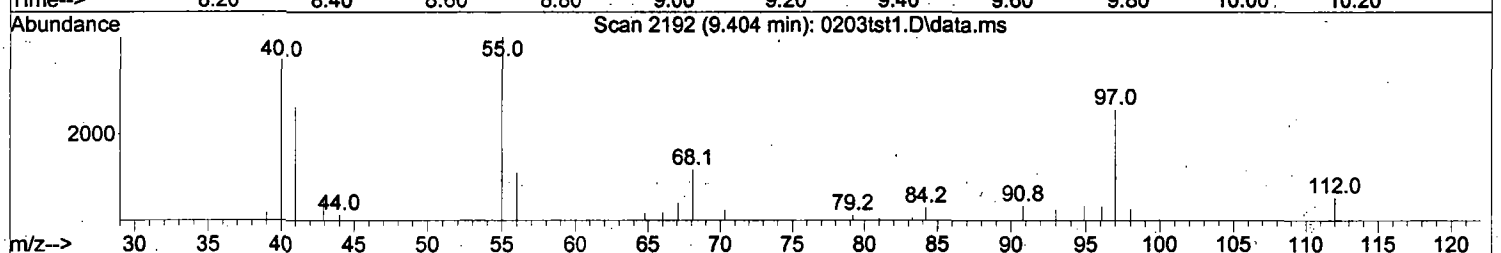
Ion	Exp%	Act%
43.00	100	100
58.00	28.10	0.00#
0.00	0.00	0.00
0.00	0.00	0.00

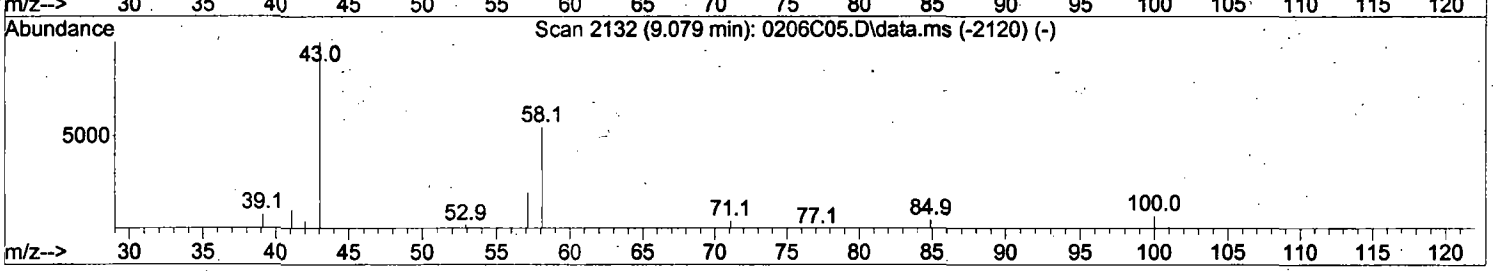
Quantitation Report (Qedit)

Data Path : D:\DATA\L02032014\
Data File : 0203tst1.D
Acq On : 3 Feb 2014 16:59
Operator : PZ PZ1-AG5975
Sample : 20uL PZSoln#1 to 100mL (SCW)
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Feb 03 17:19:14 2014
Quant Method : D:\METHODS\L01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Thu Jan 30 13:30:19 2014
Response via : Initial Calibration







TIC: 0203tst1.D\data.ms

(45) 2-HEXANONE (TMCP)

9.404min (+0.326) 0.09 ug/L

response 1025

Ion	Exp%	Act%
43.00	100	100
58.00	50.30	0.00#
57.00	18.10	0.00#
100.00	10.50	0.00#

Ex. 5 - Deliberative

Quantitation Report (QT Reviewed)

Data Path : D:\data\01312014\
Data File : 140100718.D
Acq On : 31 Jan 2014 4:35 pm
Operator : SCW OBB-AG5975
Sample : 1401007-18
Misc : WO 1401007 RARE BROMIDE
ALS Vial : 3 Sample Multiplier: 1

Quant Time: Feb 03 10:11:16 2014
Quant Method : D:\methods\THM01302014.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Fri Jan 31 14:07:25 2014
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-DIFLUOROBENZENE	6.376	114	499257	4.00	ug/L	0.00
5) CHLOROBENZENE-d5	10.196	117	473541	4.00	ug/L	0.00
9) 1,4-DICHLOROBENZENE-d4	12.696	152	211513	4.00	ug/L	0.00
System Monitoring Compounds						
3) 1,2-DICHLOROETHANE-d4	5.342	65	102294	4.15	ug/L	0.00
Spiked Amount 4.000	Range 76 - 114		Recovery = 103.75%			
6) TOLUENE-d8	8.468	98	636803	4.06	ug/L	0.00
Spiked Amount 4.000	Range 88 - 110		Recovery = 101.50%			
10) 4-BROMOFLUOROBENZENE	11.527	95	198884	3.86	ug/L	0.00
Spiked Amount 4.000	Range 86 - 115		Recovery = 96.50%			
Target Compounds						Qvalue
2) CHLOROFORM	4.701	83	275913	4.74	ug/L	98
4) BROMODICHLOROMETHANE	6.819	83	11263	0.34	ug/L	98

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : D:\DATA\L01272014\
Data File : 0127T00A.D
Acq On : 27 Jan 2014 10:33
Operator : PZ PZ1-AG5975
Sample : 25uL PZSoln#1 to 100mL
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 3 Sample Multiplier: 1

Quant Time: Jan 27 10:53:43 2014
Quant Method : D:\METHODS\L_Screen.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Tue Jan 14 14:18:43 2014
Response via : Initial Calibration

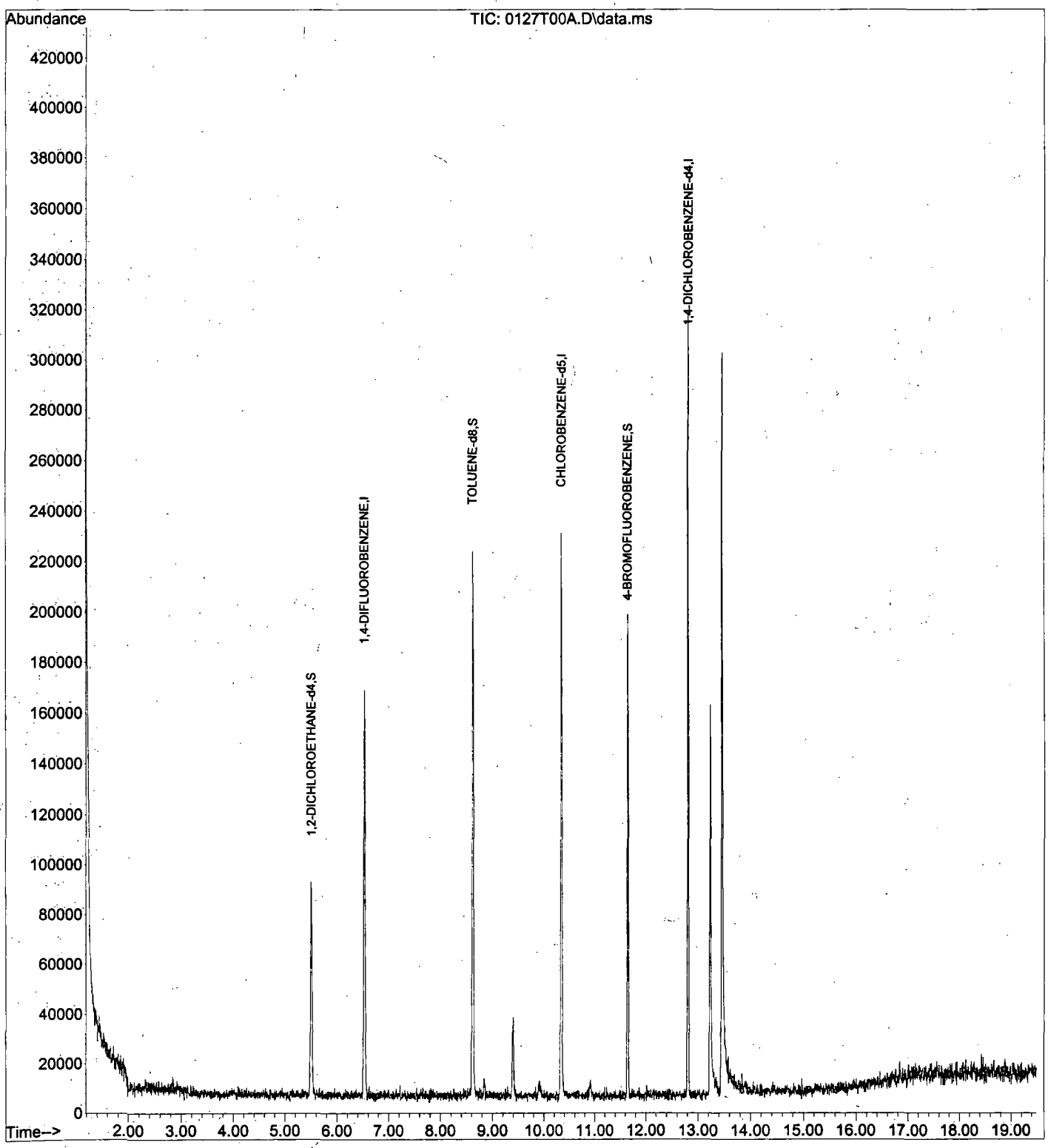
Compound	R.T.	QIon	Response	Conc	Units	Dev(Min)
Internal Standards						
1) 1,4-DIFLUOROBENZENE	6.532	114	117098	5.00	ug/L	0.00
37) CHLOROBENZENE-d5	10.341	117	109628	5.00	ug/L	0.00
56) 1,4-DICHLOROBENZENE-d4	12.811	152	51188	5.00	ug/L	0.00
System Monitoring Compounds						
23) 1,2-DICHLOROETHANE-d4	5.501	65	64217	5.64	ug/L	0.00
Spiked Amount 5.000	Range 76 - 114		Recovery = 112.80%			
41) TOLUENE-d8	8.617	98	133106	4.71	ug/L	0.00
Spiked Amount 5.000	Range 88 - 110		Recovery = 94.20%			
59) 4-BROMOFLUOROBENZENE	11.645	95	49817	5.14	ug/L	0.00
Spiked Amount 5.000	Range 86 - 115		Recovery = 102.80%			
Target Compounds						Qvalue

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data Path : D:\DATA\L01272014\
Data File : 0127T00A.D
Acq On : 27 Jan 2014 10:33
Operator : PZ PZ1-AG5975
Sample : 25uL PZSoln#1 to 100mL
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 3 Sample Multiplier: 1

Quant Time: Jan 27 10:53:43 2014
Quant Method : D:\METHODS\L_Screen.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Tue Jan 14 14:18:43 2014
Response via : Initial Calibration



Quantitation Report (QT Reviewed)

Data Path : D:\DATA\L01272014\
Data File : 0127T00B.D
Acq On : 27 Jan 2014 12:38
Operator : PZ PZ1-AG5975
Sample : 1.5uL PZSoln#1 to 100mL
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jan 27 13:02:46 2014
Quant Method : D:\METHODS\L_Screen.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Tue Jan 14 14:18:43 2014
Response via : Initial Calibration

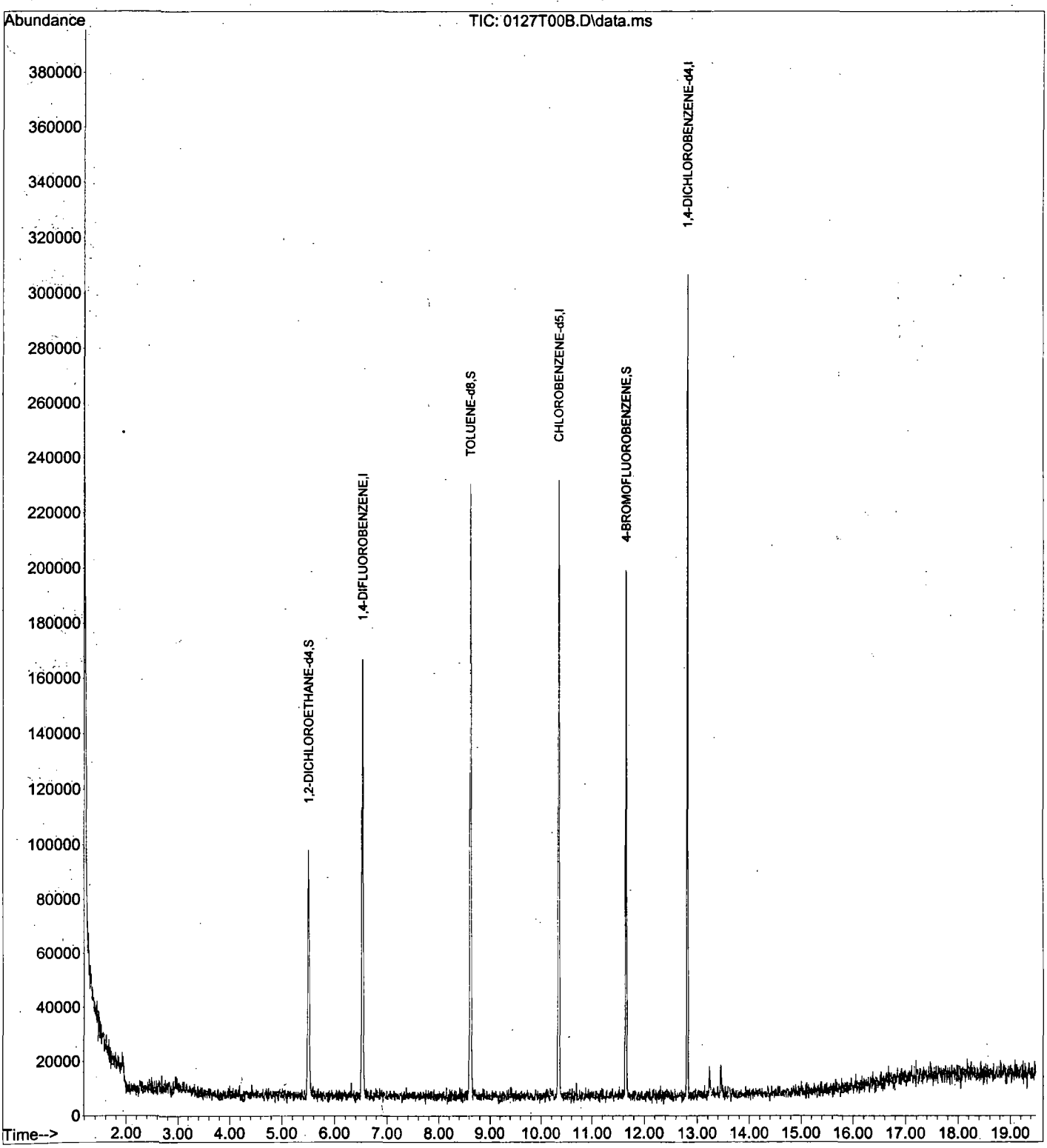
Compound	R.T.	QIon	Response	Conc	Units	Dev(Min)
Internal Standards						
1) 1,4-DIFLUOROBENZENE	6.529	114	114947	5.00	ug/L	0.00
37) CHLOROBENZENE-d5	10.341	117	113757	5.00	ug/L	0.00
56) 1,4-DICHLOROBENZENE-d4	12.808	152	51402	5.00	ug/L	0.00
System Monitoring Compounds						
23) 1,2-DICHLOROETHANE-d4	5.498	65	67848	6.07	ug/L	0.00
Spiked Amount 5.000	Range 76 - 114		Recovery = 121.40%#			
41) TOLUENE-d8	8.620	98	135973	4.64	ug/L	0.00
Spiked Amount 5.000	Range 88 - 110		Recovery = 92.80%			
59) 4-BROMOFLUOROBENZENE	11.649	95	47849	4.92	ug/L	0.00
Spiked Amount 5.000	Range 86 - 115		Recovery = 98.40%			
Target Compounds						Qvalue

(#) = qualifier out of range (m) = manual integration (+) = signals summed

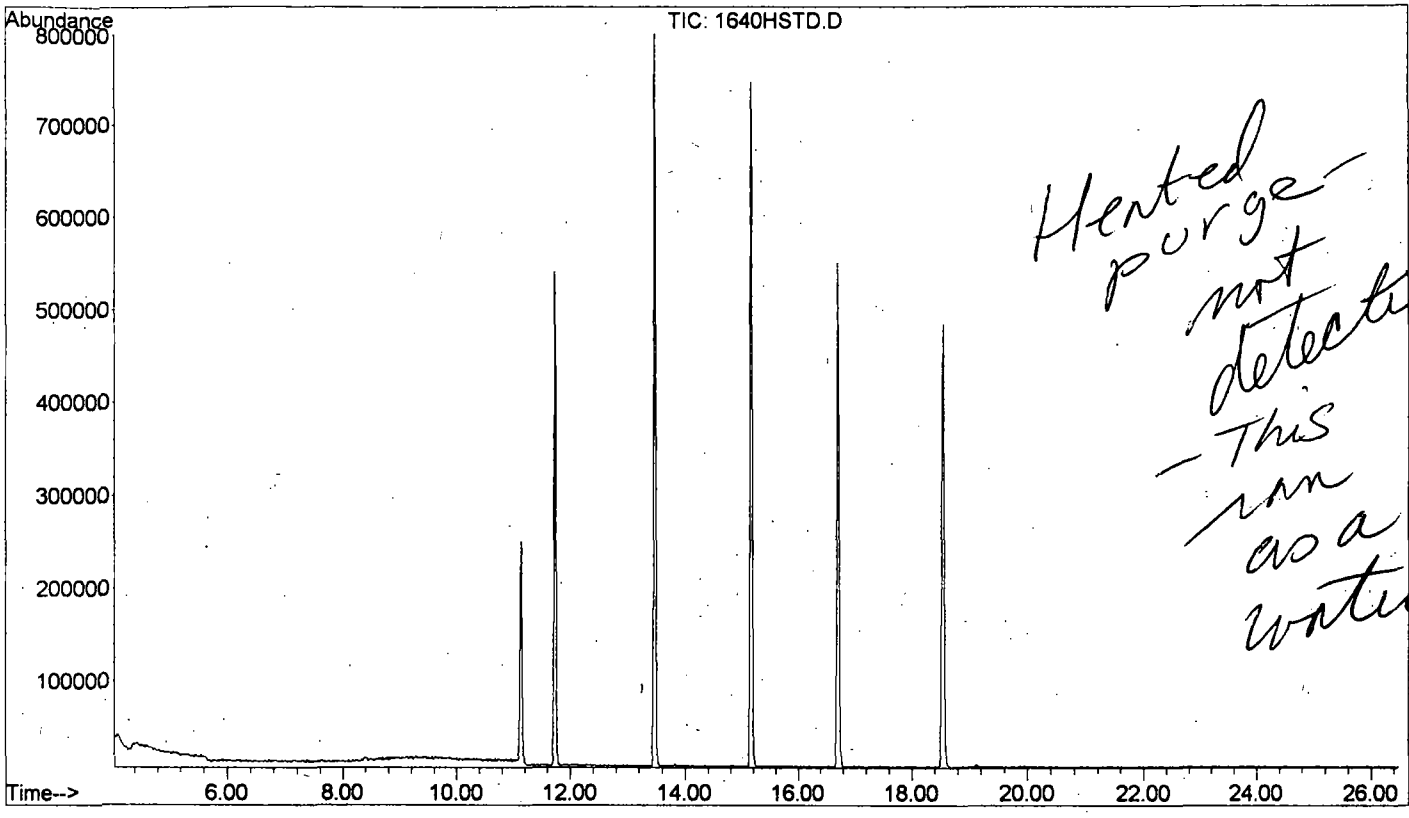
Quantitation Report (QT Reviewed)

Data Path : D:\DATA\L01272014\
Data File : 0127T00B.D
Acq On : 27 Jan 2014 12:38
Operator : PZ PZ1-AG5975
Sample : 1.5uL PZSoln#1 to 100mL
Misc : PZSoln#1= 32.8mg MCHM std - 10mL MeOH
ALS Vial : 4 Sample Multiplier: 1

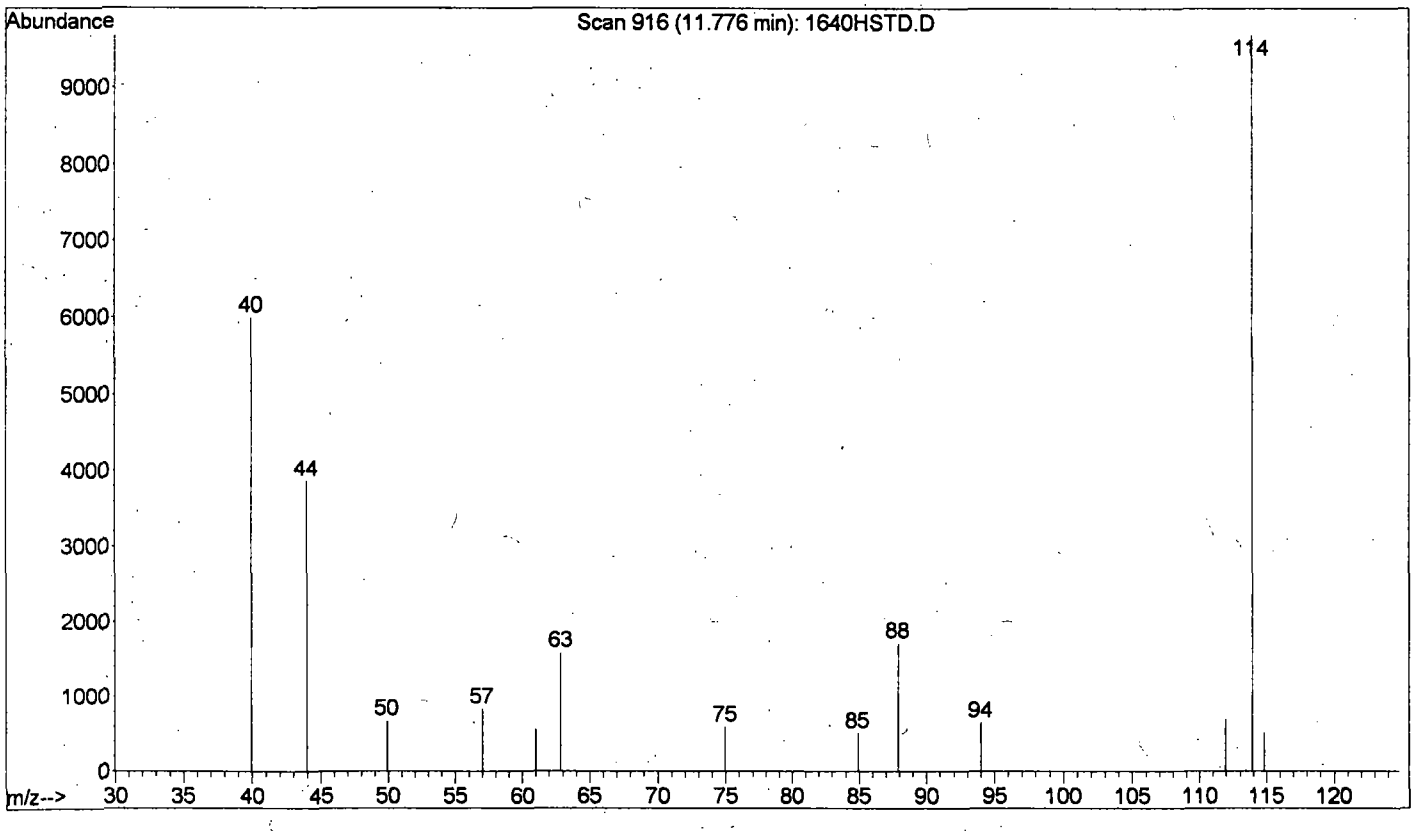
Quant Time: Jan 27 13:02:46 2014
Quant Method : D:\METHODS\L_Screen.M
Quant Title : VOA Purge and Trap LOW LEVEL Aqueous Method
QLast Update : Tue Jan 14 14:18:43 2014
Response via : Initial Calibration



File : C:\HPCHEM\1\DATA\012314\1640HSTD.D
Operator : SCW
Acquired : 23 Jan 2014 10:29 am using AcqMethod ESC
Instrument : OU-HP5972
Sample Name: 1640 PPB STD; 50 UL/100 ML MCHM;STOCK 3280PPM
Misc Info :
Vial Number: 1



Heated purge - not detected - This ran as a water



$$\frac{3280\ mg}{L} \times \frac{50\ uL}{100{,}000\ uL} = 1640\ ppb$$

EPA REGION 3 OASQA STANDARD/REAGENT PREPARATION LOG

1300480

std_Org_analytical.rpt

Description:	SCW M-HSL 12-30-2013	Expires:	12/31/2013 (13) SCW 12-31-13
Standard Type:	Other	Prepared:	12/30/2013
Department:	ORGANIC-GCMS	Prepared By:	Sue Warner
Solvent:	NA	Vendor:	AccuStandard
Final Volume (mls):	1	Vendor Lot:	213021026-01
Vials:	1	Received:	08/09/2013
Reagent Purity Checked	SCW	Mfgr Expiration:	12/13/2013

Storage: Freezer

Analyte	CAS Number	Concentration	Units
2-Butanone	78-93-3	2000	ug/mL
2-Hexanone	591-78-6	2000	ug/mL
4-Methyl-2-pentanone	108-10-1	2000	ug/mL
Acetone	67-64-1	2000	ug/mL
Carbon disulfide	75-15-0	2000	ug/mL
o-Xylene	95-47-6	2000	ug/mL
Styrene	100-42-5	2000	ug/mL
Vinyl acetate	108-05-4	2000	ug/mL

Ex. 5 - Deliberative

AccuStandard 125 Market St. · New Haven, CT 06513 · USA Tel: 203-786-5290 · www.accustandard.com

M-HSL 1 mL
Hazardous Substance List Compounds
2.0 mg/mL in MeOH
Lot: 213021026-01
Exp: Dec 13,2013
Rec'd 8-9-13
8 comps.
HIGHLY FLAMMABLE

FOR LABORATORY USE ONLY
WARNING: This product contains a chemical(s) known to the State of California to cause birth defects or other reproductive harm.
STORAGE Freeze (<-10° C)
Danger

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

TOPLEVEL PARAMETERS

Method Information For: C:\HPCHEM\1\5973\SPLITMW.M

Method Sections To Run:

( ) Save Copy of Method With Data
( ) Pre-Run Cmd/Macro =
(X) Data Acquisition
(X) Data Analysis
( ) Post-Run Cmd/Macro =

Method Comments:
HP 5973 PP Chemical Test For Octafluoronaphthalene (OFN) at 1 pg.

END OF TOPLEVEL PARAMETERS

INSTRUMENT CONTROL PARAMETERS

Sample Inlet: GC
Injection Source: GC ALS
Mass Spectrometer: Enabled

HP6890 GC METHOD

OVEN
Initial temp: 50 'C (On)
Initial time: 2.00 min
Maximum temp: 325 'C
Equilibration time: 0.00 min
Ramps:

#	Rate	Final temp	Final time
1	15.00	260	30.00
2	0.0	(Off)	

Post temp: 0 'C
Post time: 0.00 min
Run time: 46.00 min

FRONT INLET (SPLIT/SPLITLESS)
Mode: Splitless
Initial temp: 220 'C (On)
Pressure: 15.31 psi (On)
Purge flow: 50.0 mL/min
Purge time: 0.20 min
Total flow: 59.9 mL/min
Gas saver: Off
Gas type: Hydrogen

BACK INLET (VOLATILES)
Mode: Split
Initial temp: 50 'C (Off)
Pressure: 0.00 psi (Off)
Total flow: 45.0 mL/min
Gas saver: Off
Gas type: Hydrogen

COLUMN 1
Capillary Column DBI
Nominal length: 60.0 m
Nominal diameter: 250.00 um
Nominal film thickness: 0.15 um
Mode: constant flow
Initial flow: 2.0 mL/min
Nominal init pressure: 15.31 psi
Average velocity: 54 cm/sec
Inlet: Front Inlet

COLUMN 2
(not installed)

Outlet: MSD
Outlet pressure: vacuum

FRONT DETECTOR (NO DET)

SIGNAL 1
Data rate: 20 Hz
Type: test plot
Save Data: Off
Zero: 0.0 (Off)
Range: 0
Fast Peaks: Off
Attenuation: 0

COLUMN COMP 1
(No Detectors Installed)

THERMAL AUX 2
Use: MSD Transfer Line Heater
Description:
Initial temp: 260 'C (On)
Initial time: 0.00 min

#	Rate	Final temp	Final time
1		0.0(Off)	

AUX PRESSURE 4
Description:
Gas Type: Helium
Initial pressure: 0.00 psi (Off)

BACK DETECTOR (NO DET)

SIGNAL 2
Data rate: 20 Hz
Type: test plot
Save Data: Off
Zero: 0.0 (Off)
Range: 0
Fast Peaks: Off
Attenuation: 0

COLUMN COMP 2
(No Detectors Installed)

AUX PRESSURE 3
Description: HS Vial Pressure
Gas Type: Helium
Initial pressure: 0.00 psi (Off)

AUX PRESSURE 5
Description:
Gas Type: Helium
Initial pressure: 0.00 psi (Off)

POST RUN
Post Time: 0.00 min

TIME TABLE

Time	Specifier	Parameter & Setpoint

7673 Injector

Front Injector:

Sample Washes	4	
Sample Pumps	4	
Injection Volume	1.0	microliters
Syringe Size	10.0	microliters
PostInj Solvent A Washes	4	
PostInj Solvent B Washes	4	
Viscosity Delay	0	seconds
Plunger Speed	Fast	
PreInjection Dwell	0.00	minutes
PostInjection Dwell	0.00	minutes

Back Injector:
No parameters specified

MS ACQUISITION PARAMETERS

General Information

Tune File	: ATUNE.U
Acquistion Mode	: Scan

MS Information

Solvent Delay	: 0.50 min

EM Absolute : False
EM Offset : 0
Resulting EM Voltage : 2458.8

[Scan Parameters]

Low Mass : 30
High Mass : 550
Threshold : 300
Sample # : 3 A/D Samples 8
Plot 2 low mass : 283
Plot 2 high mass : 284

[MSZones]

MS Quad : 150 C maximum 200 C
MS Source : 230 C maximum 250 C

END OF MS ACQUISITION PARAMETERS

END OF INSTRUMENT CONTROL PARAMETERS

DATA ANALYSIS PARAMETERS

Method Name: C:\HPCHEM\1\5973\SPLITMW.M

Percent Report Settings

Sort By: Retention Time

Output Destination
Screen: No
Printer: Yes
File: No

Integration Events: AutoIntegrate

Generate Report During Run Method: Yes

Signal Correlation Window: 0.020

Qualitative Report Settings

Peak Location of Unknown: Apex

Library to Search Minimum Quality
C:\DATABASE\NBS75K.L 0

Integration Events: AutoIntegrate

Report Type: Summary

Output Destination

Screen: No
Printer: Yes
File: No

Generate Report During Run Method: No

Quantitative Report Settings

Report Type: Summary

Output Destination
Screen: Yes
Printer: Yes
File: No

Generate Report During Run Method: Yes

Calibration Last Updated: Mon Nov 20 15:48:49 1995

Reference Window: 10.00 Percent
Non-Reference Window: 5.00 Percent
Correlation Window: 0.02 minutes
Default Multiplier: 1.00
Default Sample Concentration: 0.00

Compound Information

1) mass 284 ( )

Ret. Time 7.28 min., Extract & Integrate from 6.78 to 7.78 min.

Signal	Rel Resp.	Pct. Unc.(rel)	Integration
Tgt 283.90			*** AUTO ***

Lvl	ID	Conc ( )	Response
3		1.000	371748
4		10.000	3849624
5		100.000	18762380
2		0.100	31150

Qualifier Peak Analysis ON
Curve Fit: Avg. RF

2) mass 283 ( )

Ret. Time 7.28 min., Extract & Integrate from 6.78 to 7.78 min.

Signal	Rel Resp.	Pct. Unc.(rel)	Integration
Tgt 283.90			*** AUTO ***

Lvl	ID	Conc ( )	Response
3		1.000	371748
4		10.000	3849624
5		100.000	18762380
2		0.100	31150

Qualifier Peak Analysis ON
Curve Fit: Avg. RF

3) mass 247 ( )

Ret. Time 7.28 min., Extract & Integrate from 6.78 to 7.78 min.

Signal	Rel Resp.	Pct. Unc.(rel)	Integration
Tgt 246.90			*** AUTO ***

Lvl	ID	Conc ( )	Response
3		1.000	44562
4		10.000	479738
5		100.000	2662997
2		0.100	-1

Qualifier Peak Analysis ON
Curve Fit: Avg. RF

---

4) mass 212 ( )

Ret. Time 7.28 min., Extract & Integrate from 6.78 to 7.78 min.

Signal	Rel Resp.	Pct. Unc.(rel)	Integration
Tgt 212.00			*** AUTO ***

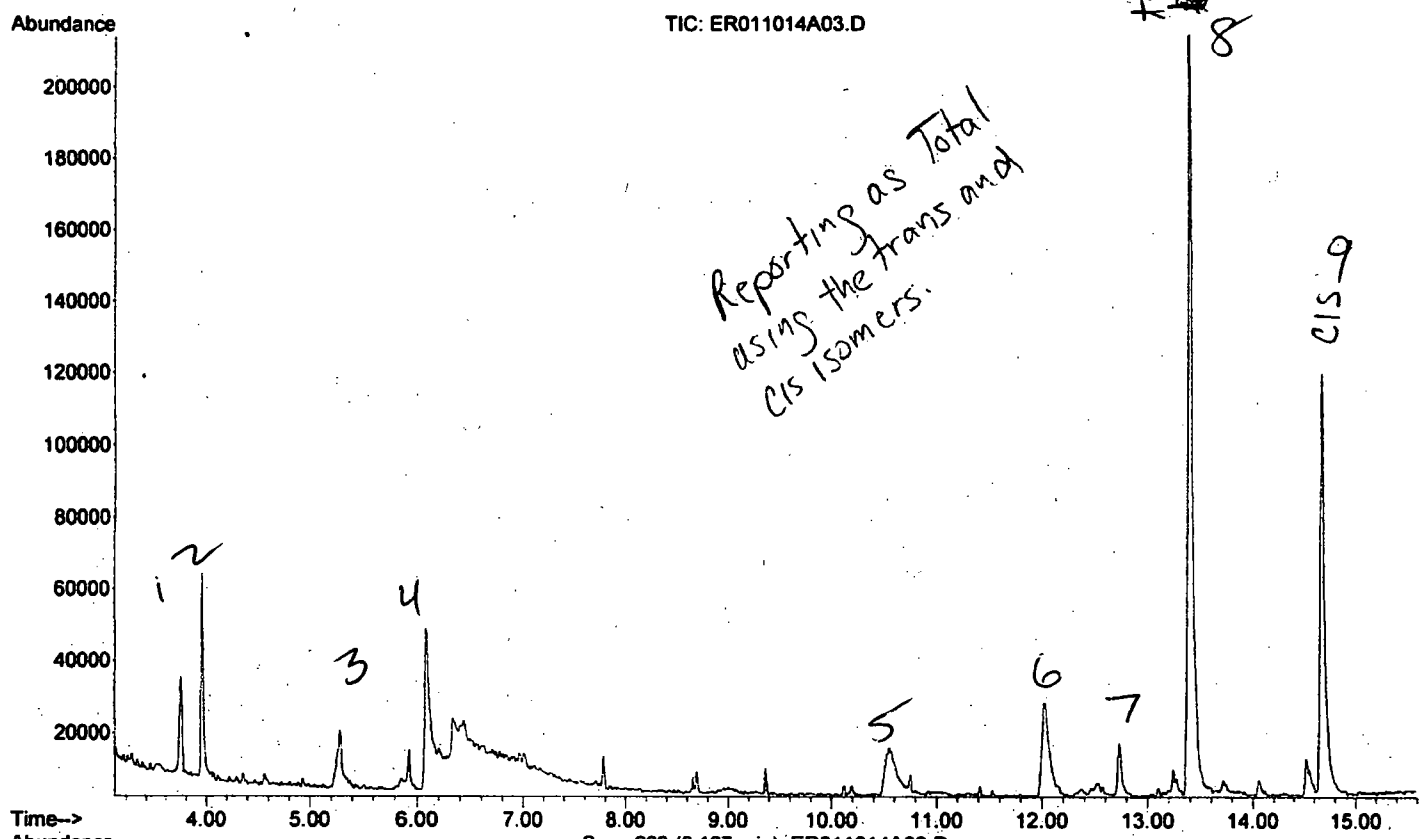
Lvl	ID	Conc ( )	Response
3		1.000	25707
4		10.000	264918
5		100.000	1532237
2		0.100	-1

Qualifier Peak Analysis ON
Curve Fit: Avg. RF

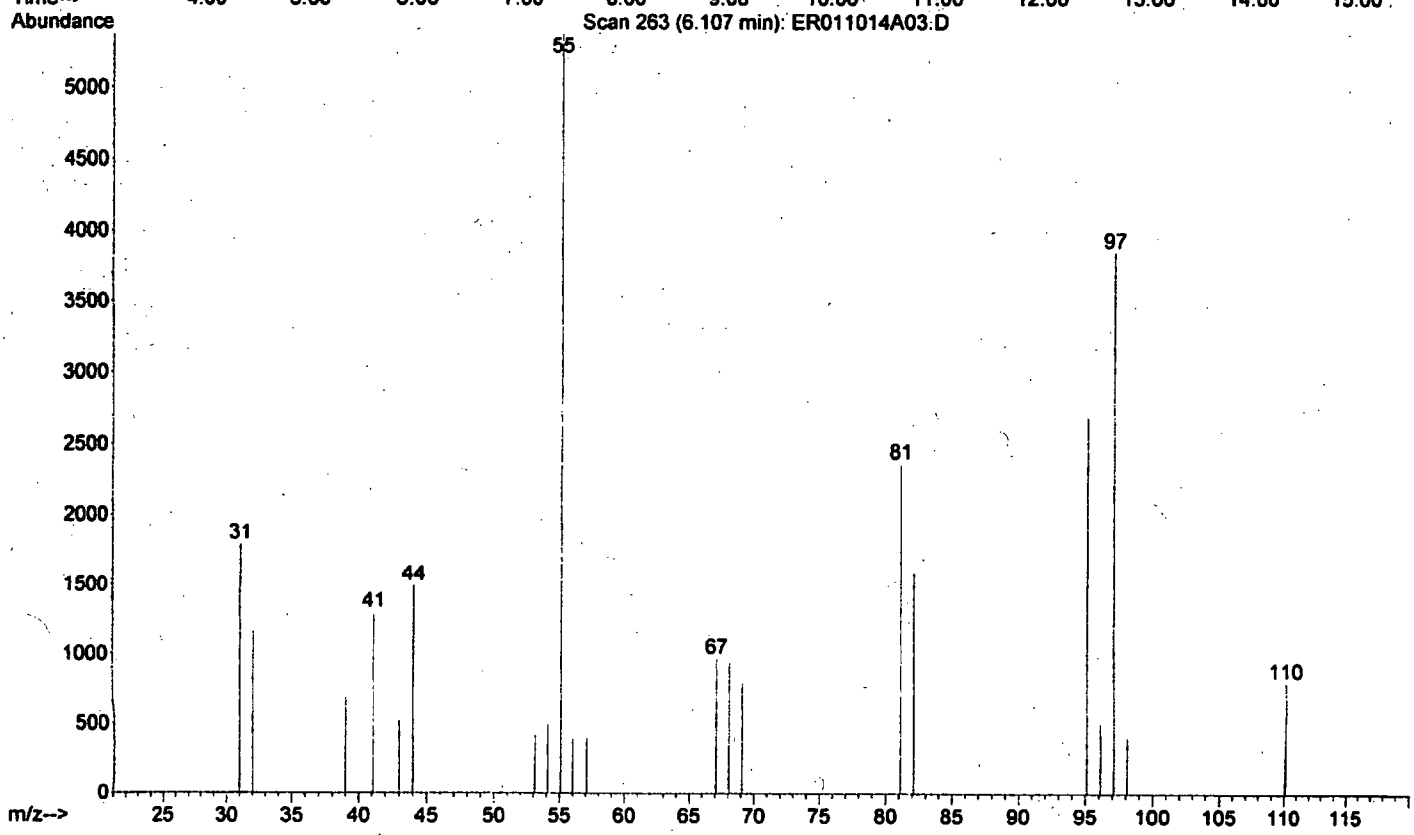
END OF DATA ANALYSIS PARAMETERS

Fri Jan 10 11:25:17 2014

File : C:\MSDCHEM\1\DATA\011014\Snapshot\ER011014A03.D
Operator : RRP
Acquired : 10 Jan 2014 14:55 using AcqMethod 011014EMERGENCYRESPONSE.M
Instrument : FUNGO
Sample Name: 11.89 PPM ~~for each isomer~~ Total concentration
Misc Info :
Vial Number: 4



Reporting as Total using the trans and cis isomers.



1-410-305-2653

slayton.joe@epa.gov

1.00

Warner, Sue

From: Caporale, Cynthia
Sent: Sunday, January 12, 2014 12:50 PM
To: Gundersen, Jennifer
Cc: Warner, Sue; Wilding, Stevie
Subject: FW: Getting a sample of product

-----Original Message-----
From: Kelly, Jack (R3 Phila.)
Sent: Sunday, January 12, 2014 12:45 PM
To: Caporale, Cynthia
Subject: Fw: Getting a sample of product

Cindy, will this work?

From: Linden, melissa
Sent: Sunday, January 12, 2014 12:42:39 PM
To: Burns, Francis; Kelly, Jack (R3 Phila.)
Cc: Matlock, Dennis
Subject: Getting a sample of product

START looked in the manway of the two tanks that didn't fail, they only contain a sludge like material no pure product to sample. We know that the facility purchased the MCHM from Eastman so we could purchase it from them to make the standard

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Warner, Sue

From: Caporale, Cynthia
Sent: Sunday, January 12, 2014 4:00 PM
To: Gundersen, Jennifer; Warner, Sue; Wilding, Stevie
Subject: FW: Getting a sample of product

-----Original Message-----
From: Kelly, Jack (R3 Phila.)
Sent: Sunday, January 12, 2014 3:27 PM
To: Linden, melissa; Burns, Francis; Caporale, Cynthia
Subject: Re: Getting a sample of product

Thanks, Melissa.
Cindy, any value in doing this regardless? Or grabbing some "sludge" at the site?

From: Linden, melissa
Sent: Sunday, January 12, 2014 3:24:23 PM
To: Kelly, Jack (R3 Phila.); Burns, Francis
Subject: Re: Getting a sample of product

Hey Jack,

Eastman only has the Crude MCHM as a product they sell, but it's actually a waste product of another chemical process that now has a commercial application. That's why on the MSDS there is a range of weight percent of the components and its not exact because of it being a waste product and varies by batch so that will affect our ability to make a standard.

From: Kelly, Jack (R3 Phila.)
Sent: Sunday, January 12, 2014 12:52:42 PM
To: Matlock, Dennis; Linden, melissa
Cc: Burns, Francis; Caporale, Cynthia
Subject: Fw: Getting a sample of product

Ok. We can work on tomorrow....

Ex. 5 - Deliberative

From: Caporale, Cynthia
Sent: Sunday, January 12, 2014 12:50:49 PM
To: Kelly, Jack (R3 Phila.)
Subject: RE: Getting a sample of product

We found material from vendor for the one compound to use as a standard but it might be helpful to have the MCHM/mixture from Eastman if that's possible.

-----Original Message-----
From: Kelly, Jack (R3 Phila.)
Sent: Sunday, January 12, 2014 12:45 PM
To: Caporale, Cynthia
Subject: Fw: Getting a sample of product

Cindy, will this work?

From: Linden, melissa
Sent: Sunday, January 12, 2014 12:42:39 PM

To: Burns, Francis; Kelly, Jack (R3 Phila.)
Cc: Matlock, Dennis
Subject: Getting a sample of product

START looked in the manway of the two tanks that didn't fail, they only contain a sludge like material no pure product to sample. We know that the facility purchased the MCHM from Eastman so we could purchase it from them to make the standard

Warner, Sue

From: binetti, victoria
Sent: Sunday, January 12, 2014 4:31 PM
To: Wisniewski, Patti-Kay; Kelly, Jack (R3 Phila.); Caporale, Cynthia; Warner, Sue; Campagna, Philip
Cc: Werner, Lora; Casillas, Laura; Matlock, Dennis; Markiewicz, Karl; Linden, melissa; Larry Cseh; Mickunas, Dave
Subject: RE: Eastman Crude MCHM - 4-methylcyclohexanemethanol

I spoke with Ex. 6 - Personal Privacy from American Water. All the labs that are doing analyses for this event (and there are many, including Civil Support and others) are using the same method. If I understand this (maybe not), the DuPont method is the same as the Eastman method, but with the addition of a standard for MCHM (developed from the product at Freedom Industries), for better quantification. I guess the key is that everyone is using the same method. Cindy, I mentioned to Walt Ivey (WV DHHR, Bureau for Public Health) that you would be trying to get the method from their lab, (He said he'd been intending to get it to us, it's just that they've been very pressed.)--Vicky

-----Original Message-----
From: Wisniewski, Patti-Kay
Sent: Sunday, January 12, 2014 12:06 PM
To: Kelly, Jack (R3 Phila.); Caporale, Cynthia; Warner, Sue; Campagna, Philip; binetti, victoria
Cc: Werner, Lora; Casillas, Laura; Matlock, Dennis; Markiewicz, Karl; Linden, melissa; Larry Cseh; Mickunas, Dave
Subject: RE: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Jack,
How about if WPD determines method in use by WVAW first. They have not asked for EPA support specifically. Sounds as thought Civil Support is using the DuPont method and not the Eastman method, but who knows.

Vicky stated she would contact American, so perhaps she can find an answer first.

Patti Kay

From: Kelly, Jack (R3 Phila.)
Sent: Sunday, January 12, 2014 11:59 AM
To: Caporale, Cynthia; Warner, Sue; Campagna, Philip; Wisniewski, Patti-Kay; binetti, victoria
Cc: Werner, Lora; Casillas, Laura; Matlock, Dennis; Markiewicz, Karl; Linden, melissa; Larry Cseh; Mickunas, Dave
Subject: Fw: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Karl heard back from Dupont. This looks promising. Maybe we should try to get him on a call with the American Water guy(s).

From: Markiewicz, Karl
Sent: Sunday, January 12, 2014 10:35:43 AM
To: Kelly, Jack (R3 Phila.)
Subject: Fw: Eastman Crude MCHM - 4-methylcyclohexanemethanol

FYI

From: Markiewicz, Karl

Sent: Sunday, January 12, 2014 10:02:49 AM
To: Mickunas, Dave
Cc: lkw9@cdc.gov; Ex. 6 - Personal Privacy
Subject: Fw: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Hello Dave,

Here's the latest email from Mike (Dupont). I've copied him on the email so you 2 can start communications.

Sincerely,

Karl

From: Ex. 6 - Personal Privacy
Sent: Sunday, January 12, 2014 9:44:42 AM
To: Markiewicz, Karl
Subject: RE: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Hi Karl,

I haven't had time to do an official MDL study, but component peaks have about a 2:1 s/n at the 0.01 ppm level, and matrix spikes and duplicates all look real good. To give ourselves a little leeway however, I have set our reporting limit as 0.1 ppm.

Levels in the feed to the water company plant are down at that level. The water exiting the plant is still between 0.5 and 1 ppm. It's hard to explain to some folks how activated carbon equilibria works. We're getting there.

Ex. 6 - Personal Privacy

From: Markiewicz, Karl [mailto:Markiewicz.Karl@epa.gov]
Sent: Sunday, January 12, 2014 7:08 AM
To: Ex. 6 - Personal Privacy
Cc: lkw9@cdc.gov
Subject: Re: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Thabks Ex. 6 - Personal Privacy l,

Not problem - I know how hectic these responses are. I've seen emails indicating that the DL for MCHM is 10 ppb.

You guys are doing a great job and we appreciate all the support and effort.

Sincerely,

Karl

Ex. 6 - Personal Privacy

Sent: Sunday, January 12, 2014 3:31:01 AM
To: Markiewicz, Karl

Cc: lkw9@cdc.gov<mailto:lkw9@cdc.gov>
Subject: RE: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Hello Karl,

I started this reply once before and got pulled away. At this point I have had little time for anything other than monitoring of the primary component 4-methylcyclohexanemethanol. Besides setting up additional GC's in my lab, preparing standards for contract lab evaluation, preparing odor profile standards for multiple groups, and trying to keep up with the ever increasing sample load, I have also been assisting three National Guard Mobile units in setting up the analysis on their equipment (with limited success).

Some air monitoring samples on activated charcoal would have been nice to look at. Reports coming to me as my lab techs rotate in and out, are that recent rains have almost completely eliminated the odor downtown. A lost opportunity to study some dispersion patterns???

Barry Lindley (another chemist at the site) and I have had much the same suspicion as to the various odors.

Maybe once the dust settles I can go back and rehash the data.

Ex. 6 - Personal Privacy
Sr. Chemist
Dupont Chemicals and Fluoroproducts

Dupont Belle Plant
901 W Dupont Ave.
Belle, WV 25015

Ex. 6 - Personal Privacy

From: Markiewicz, Karl [mailto:Markiewicz.Karl@epa.gov]
Sent: Friday, January 10, 2014 2:42 PM
To: Ex. 6 - Personal Privacy
Cc: lkw9@cdc.gov<mailto:lkw9@cdc.gov>
Subject: Eastman Crude MCHM - 4-methylcyclohexanemethanol

Hello Michael,

I'm a toxicologist with CDC/ATSDR and involved with the WV spill response. I was given your email from a member of the response team within EPA.

I understand that you've developed the analytical standard and methods for 4-methylcyclohexanemethanol and maybe for all the components of the mixture. Can you provide detection limits for 4-methylcyclohexanemethanol and others if available?

We believe the licorice odor is related to the 4-(MethoxyMethyl) cyclohexaneMethanol(98955-27-2) in the mixture. Its my understanding that as time has progressed the licorice odor has diminished and a sweet (alcohol?) odor is now detectable. Do you think the ether has dissipated and now the alcohols are predominated the odor profile?

Eastman Crude MCHM

Weight %	Component	CAS Registry No.
68 . 89%	4-methylcyclohexanemethanol	34885-03-5
4 - 22%	4-(methoxymethyl)cyclohexanemethanol	98955-27-2
4 - 10%	water	7732-18-5
5%	methyl4-methylcyclohexanecarboxylate	51181-40-9
1%	dimethyl 1,4-cyclohexanedicarboxylate	94-60-0
1%	methanol	67-56-1
1-2%	1,4-cyclohexanedimethanol	105-08-8

Sincerely,

Karl

Karl V. Markiewicz PhD
Senior Toxicologist
DHHS/CDC/ATSDR
MailStop: 3HS00
1650 Arch Street
Philadelphia, PA 19103
215-814-3149 (office)
kvm4@cdc.gov<mailto:kvm4@cdc.gov>

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Warner, Sue

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Sent: Sunday, January 12, 2014 12:00 PM
To: Caporale, Cynthia; Warner, Sue; Campagna, Philip; Wisniewski, Patti-Kay; binetti, victoria
Cc: Werner, Lora; Casillas, Laura; Matlock, Dennis; Markiewicz, Karl; Linden, melissa; Larry Cseh; Mickunas, Dave
Subject: Fw: Eastman Crude MCHM - 4-methylcyclohexanemethanol

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FYI

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Sent: Sunday, January 12, 2014 10:02:49 AM
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Ex. 5 - Deliberative

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Ok. You folks see what you can do. You may have more luck given your program. American Water probably wonders what an OSC is.
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Philadelphia, PA 19103
215-814-3149 (office)
kvm4@cdc.gov<mailto:kvm4@cdc.gov>

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Charleston, WV Chemical Leak
USEPA Region 3
Concept of Operations Document– EPA ConOps
January 11, 2014

Operational Period: January 12, 2014: 800hrs-January 19, 2014: 0759hrs
24 Hour Number: 215.814.3255
24 Hour National Response Center Number – 800. 424. 8802
(to report new and oil or hazardous substances release)
www.epaosc.org/charlestonwvchemicalleak

Key Participants:

EPA Federal On-Scene Coordinator (FOSC) – EPA's Incident Commander is Dennis Matlock

Other USEPA
- Region 3 Incident Management Team (IMT)
- Special Teams
  - EPA Environmental Response Team (ERT)
  - EPA Office of Ground Water and Drinking Water Development (ORD)
  - Regional Water Protection Division Water Program (WPD)
  - EPA Region 3 Laboratory
- Contracted Resources
  - Superfund Technical Assistance and Response Team Contractor (START)
  - Emergency Response and Removal Services Contractor (ERRS)
  - Contract Laboratory Network

Agency for Toxic Substances and Disease Registry (ATSDR)

A. Purpose:

The U.S. Environmental Protection Agency (EPA) Region 3 Office of *Preparedness and Response (OPR)* maintains response capabilities, through the authorities of the FOSC, to respond to a release and/or a threatened release of oil and hazardous substances 24 hours a day, 365 days per year. The activities associated with the Charleston, WV Chemical Leak (CWVCL) are complex enough to merit EPA to deploy these capabilities so response actions can occur in a timely manner.

B. Communications:

Requests for EPA support should come the EPA R3 Regional Operations Center (EPA3 REOC) Phone Duty Officer using the 24 hour Number: 215.814.3255

C. Implementation:

The assets described below in this document:

- Are available to support the State of West Virginia in its response to the release, and in its restoration of water systems to a healthy functioning state.
- Can be deployed under the EPA FOSC's authority per the National Contingency Plan (NCP) in service of the State directly, and/or under the National Response Framework in support of FEMA Mission Assignments.
- Are both regional and national and may be obtained through EPA Special Teams under the National Contingency Plan (NCP), but are coordinated thru the EPA FOSC (IC).
- May be accessed by contacting the **24 Hour EPAR3EOC Number: 215.814.3255**.

EPA's Region 3 Incident Management Team (IMT) is supporting FOSCs (who are located on scene) from the EPA3 REOC, located in Philadelphia, PA.

EPA oil and hazardous substance response support is provided by EPA On-Scene Coordinators (FOSCs) who coordinate and direct response to releases of hazardous substances and discharges of oil to navigable waters *as authorized by the National Contingency Plan (NCP)*. The EPA FOSC will coordinate all EPA resources including its special teams.

If FEMA issues a pending EPA a mission assignment, then these same EPA resources will be available for Emergency Support Function #10 response pursuant to the National Response Framework. The EPA resources will be integrated into the FEMA Consequence Management Branch and will be staged or managed from the Incident Command Post, per EPA FOSC determination.

EPA R3 is prepared to send additional, comparable resources however they are needed as the incident changes.

D. EPA R3 Assets and their Capabilities:

The **FOSC**, are on scene responding pursuant to the NCP. They have the capabilities to address hazardous substance mitigation, environmental sampling and analysis, direct read-out air monitoring support, personnel decontamination support and other similar assistance. They also have the ability to respond more broadly under a FEMA mission assignment which is pending FEMA approval.

The **EPA3 REOC**, located in Philadelphia, is supporting the Response. The REOC can provide backup resources, technical information and coordinate with EPA HQ in Washington DC. These resources include:

- Additional FOSC support.
- A fully trained EPA R3 Incident Management Team (IMT).
- The Response Support Corps (RSC), a cadre of program/media trained professionals to

augment oversight of field activities and provide experts in specific program fields like drinking water and others;

- Representatives from the Agency for Toxic Substances and Disease Registry (ATSDR) for environmental health assessment and consult purposes;
- Additional public information officer resources for direct assistance to the local health departments;
- Additional support as needed under the NRF.

Analytical Resources:
EPA Region 3 Laboratories and a Contract Laboratory Network—The EPA Regional Lab can assist in sample processing and can augment sampling capacities for the response through its laboratory network.

EPA Special Teams:
EPA Environmental Response Team (ERT)—has the capacity for mobile multi-media sample screening and real time air monitoring and screening. EPA ERT's Trace Atmospheric Gas Analyzer (TAGA) instruments can measure concentrations of pre-selected industrial compounds in the air at the parts-per-billion level as the bus is being driven down the street;

EPA Office of Ground Water and Drinking Water Development (OGWDWD)--Professionals with a focus on drinking water security, distribution system water quality, and monitoring for contamination incidents.

Water Protection Program (WPD)--Water Protection Program personnel are available on reach back or on the ground capacity to provide technical guidance on water safety concerns to facilities, local health departments and others.

Contracted Resources:

Superfund Technical Assistance and Response Team Contractor (START) and Superfund Emergency Response and Removal Services Contractor (ERRS) EPA contractors are ready to deploy their technical air monitoring, data management, and heavy earth moving equipment.

D. Outreach:

EPA has and will provide **Liaison Officers (LNOs)** where requested either by FEMA/DHS or Local Governments. At this time our LNO is actively maintaining the EOC informed of local needs and press briefings.

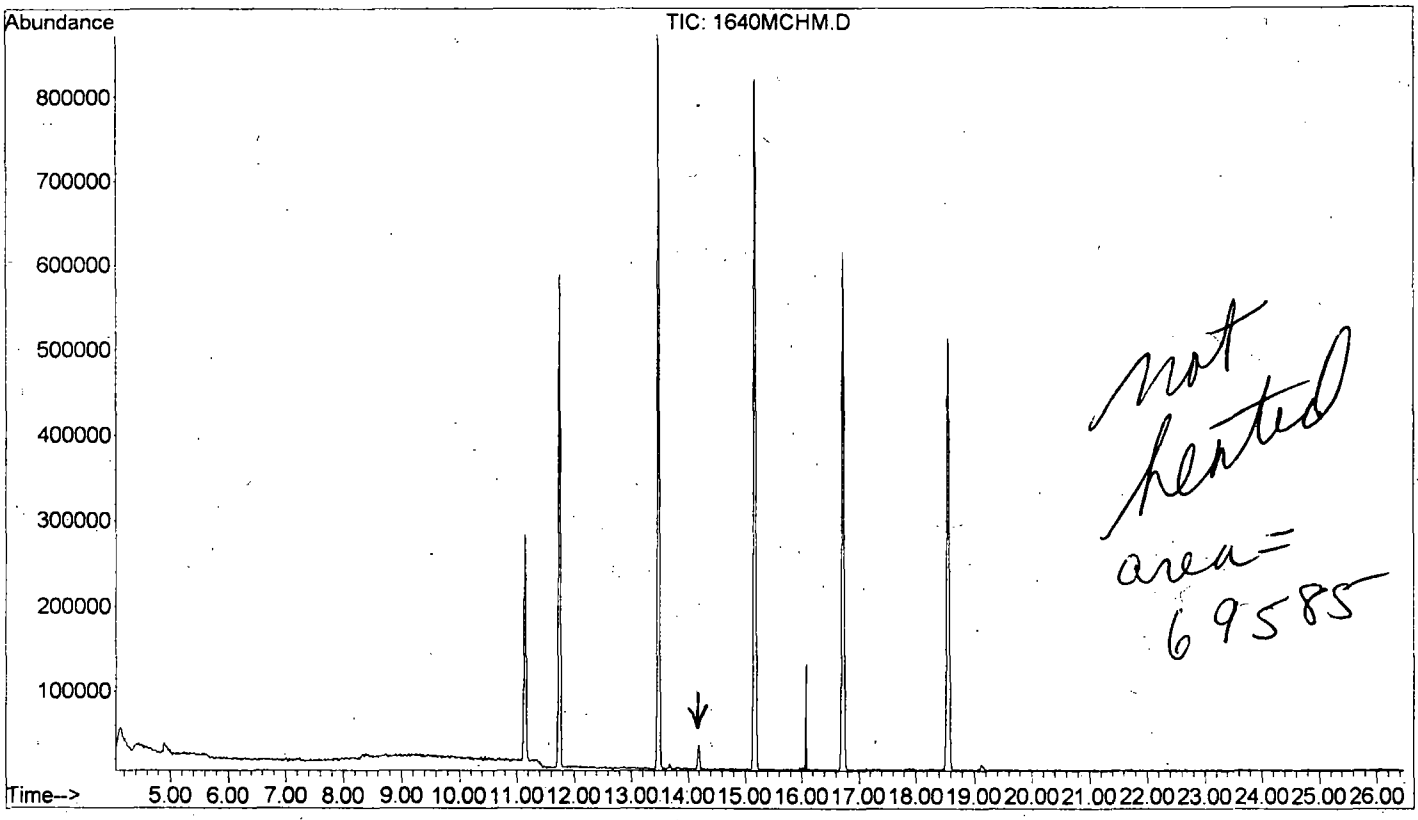
EPA has and will provide **Public Information Officers (PIO)** available to augment the capacity of local health departments to reach large numbers of public.

35TH CST (WMD) SAMPLE LOG FOR WV AMERICAN WATER INCIDENT As of: 1/11/2014 19:00

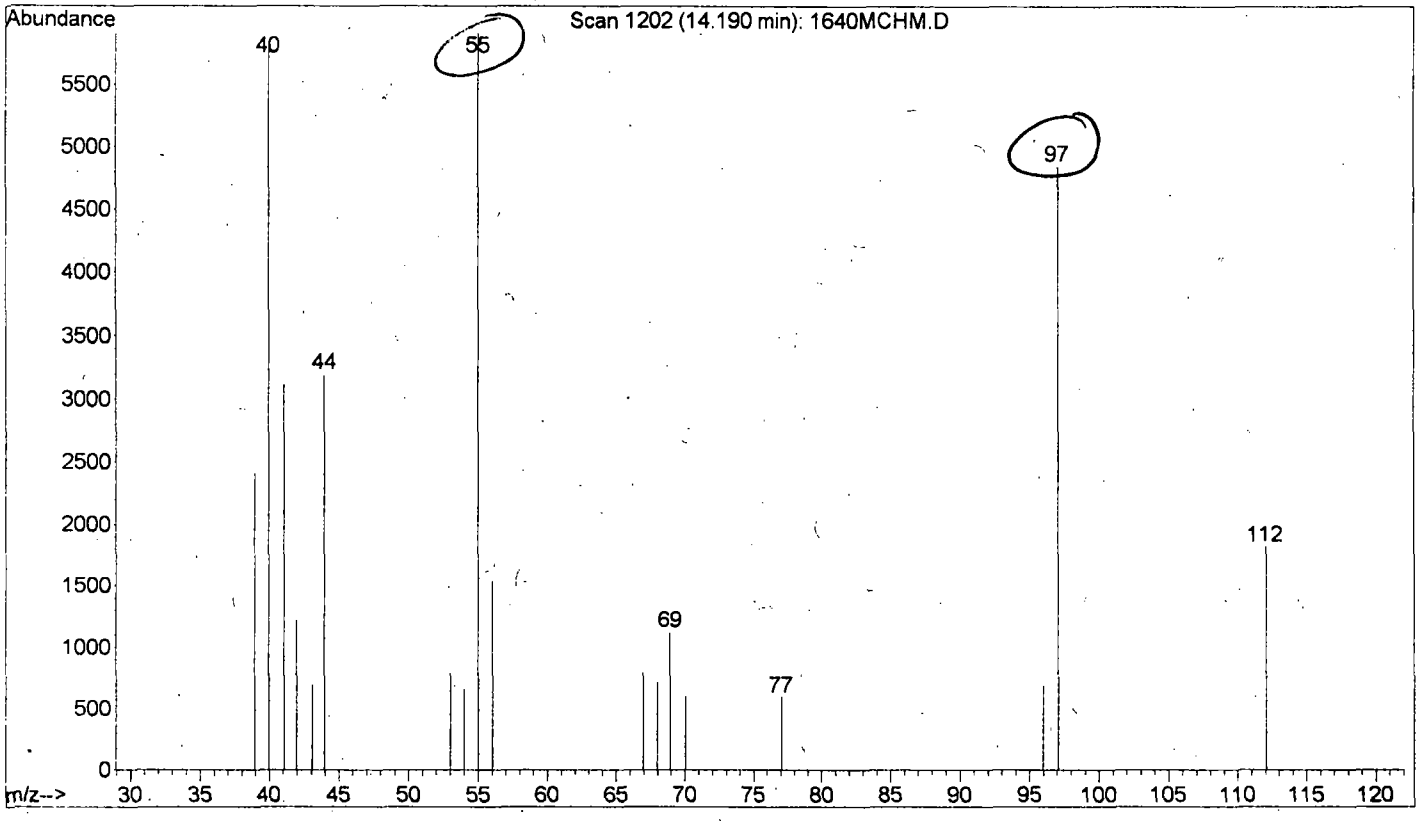
SAMPLE LOCATION / COUNTY	DTG	SAMPLE NUMBER	SAMPLE TEAM	RAW INTAKE RESULTS	FINISHED WATER RESULTS
WVAW / Kanwaha	101230RJAN14	12:30	WVAMW	1.04 PPM	1.021 PPM
				3.35 PPM	1.56 PPM
WVAW / Kanwaha	101355RJAN14	13:55	WVAMW	1.229 PPM	0.906 PPM
				1.19 PPM	1.3 PPM
WVAW / Kanwaha	101600RJAN14	16:00	WVAMW	1.222 PPM	0.856 PPM
				1.39 PPM	1.23 PPM
WVAW / Kanwaha	101755RJAN14	17:55	WVAMW	0.802 PPM	0.777 PPM
				1.27 PPM	1.28 PPM
WVAW / Kanwaha	101950RJAN14	19:50	WVAMW	0.785 PPM	0.809 PPM
				2.2 PPM	2.4 PPM
WVAW / Kanwaha	112300RJAN14	23:00	WVAMW	1.70 PPM	0.75 PPM
WVAW / Kanwaha	110100RJAN14	1:00	WVAMW	1.647 PPM	0.628 PPM
WVAW / Kanwaha	110300RJAN14	3:00	WVAMW	1.081 PPM	0.649 PPM
WVAW / Kanwaha	110500RJAN14	5:00	WVAMW	1.87 PPM	1.01 PPM
WVAW / Kanwaha	110700RJAN14	7:00	WVAMW	1.30 PPM	1.10 PPM
WVAW/Kanawha	110902RJAN14	9:02	WVAMW	0.70 PPM	0.60 PPM
WVAW / Kanwaha	111000JAN14	10:00	WVAMW	0.488 PPM	0.622 PPM
WVAW/Kanawha	111415RJAN14	14:15	WVAMW	0.8 PPM	0.30 PPM

1000 ppb

File : C:\HPCHEM\1\DATA\012314\1640MCHM.D
Operator : SCW
Acquired : 23 Jan 2014 8:11 am using AcqMethod ESC
Instrument : OU-HP5972
Sample Name: 1640 PPB STD; 50 UL/100 ML MCHM;STOCK 3280PPM
Misc Info :
Vial Number: 1



not tented
area = 69585

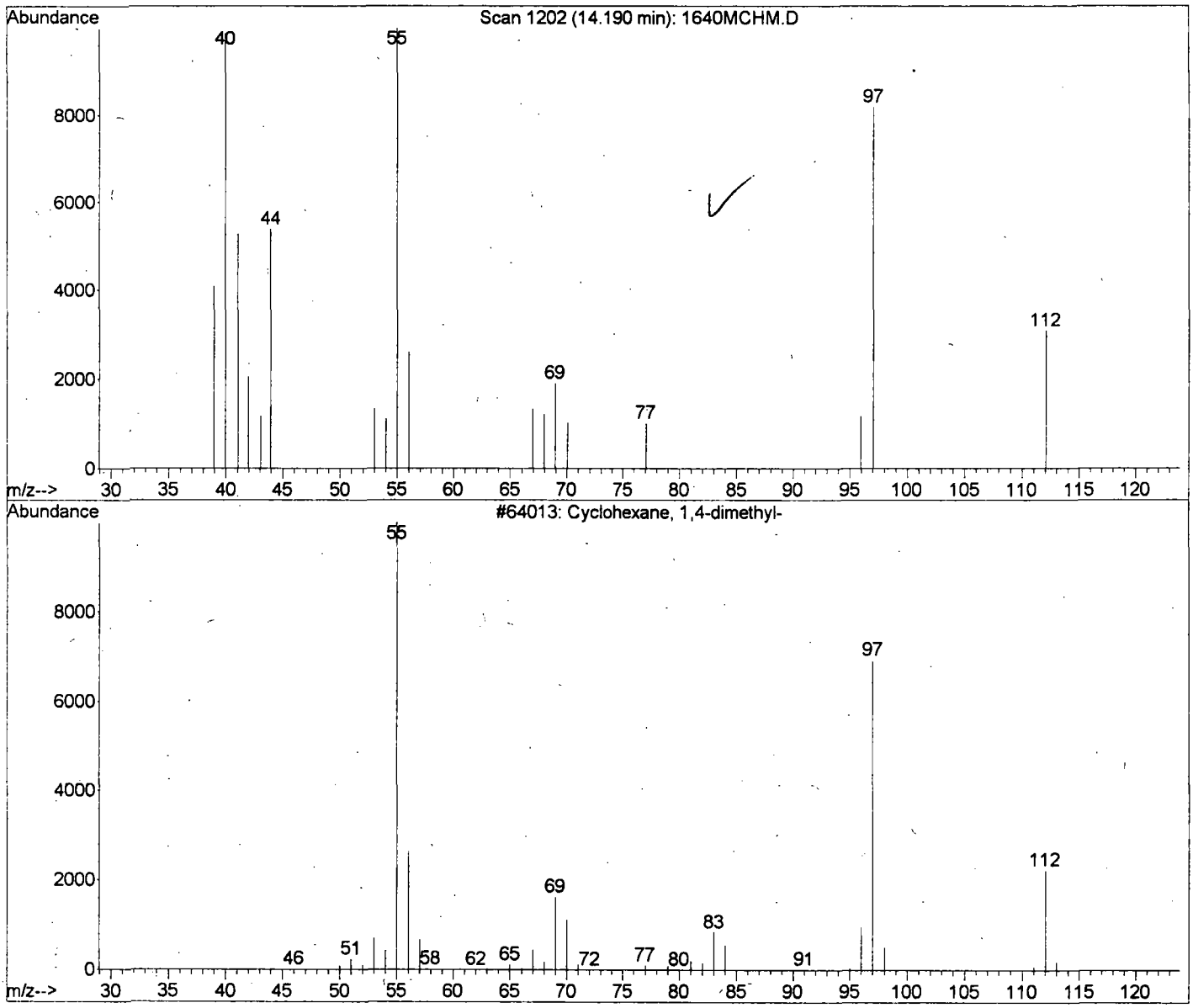


TIC: 1640MCHM.D

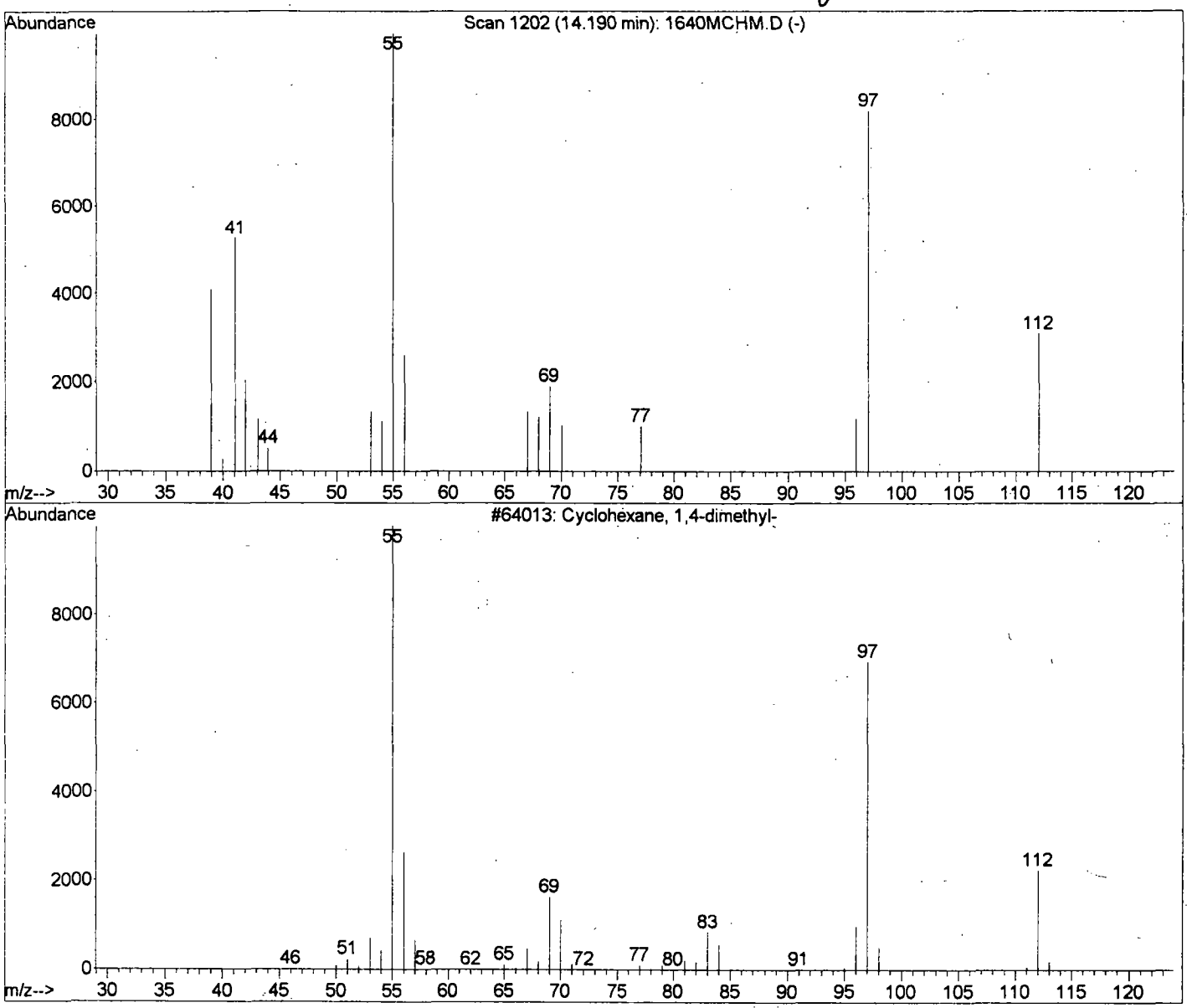
1640 PPB STD; 50 UL/100 ML MCHM;STOCK 3280PPM

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.149	rVB	0.253	208565	4.073	4.326
2	4.891	rVB	0.169	73125	4.866	5.035
3	11.136	rVB	0.143	662411	11.085	11.228
4	11.743	rVB	0.143	1300017	11.676	11.819
5	13.473	rBV	0.186	1967017	13.397	13.583
6	14.190	rBV	0.110	69585	14.123	14.232
7	15.169	rBV	0.169	2055918	15.093	15.262
8	16.072	rBV	0.068	70013	16.046	16.114
9	16.713	rBV	0.177	1569380	16.620	16.797
10	18.544	rVB	0.228	1442353	18.418	18.645

Library Searched : C:\DATABASE\NBS75K.L
Quality : 90
ID : Cyclohexane, 1,4-dimethyl-

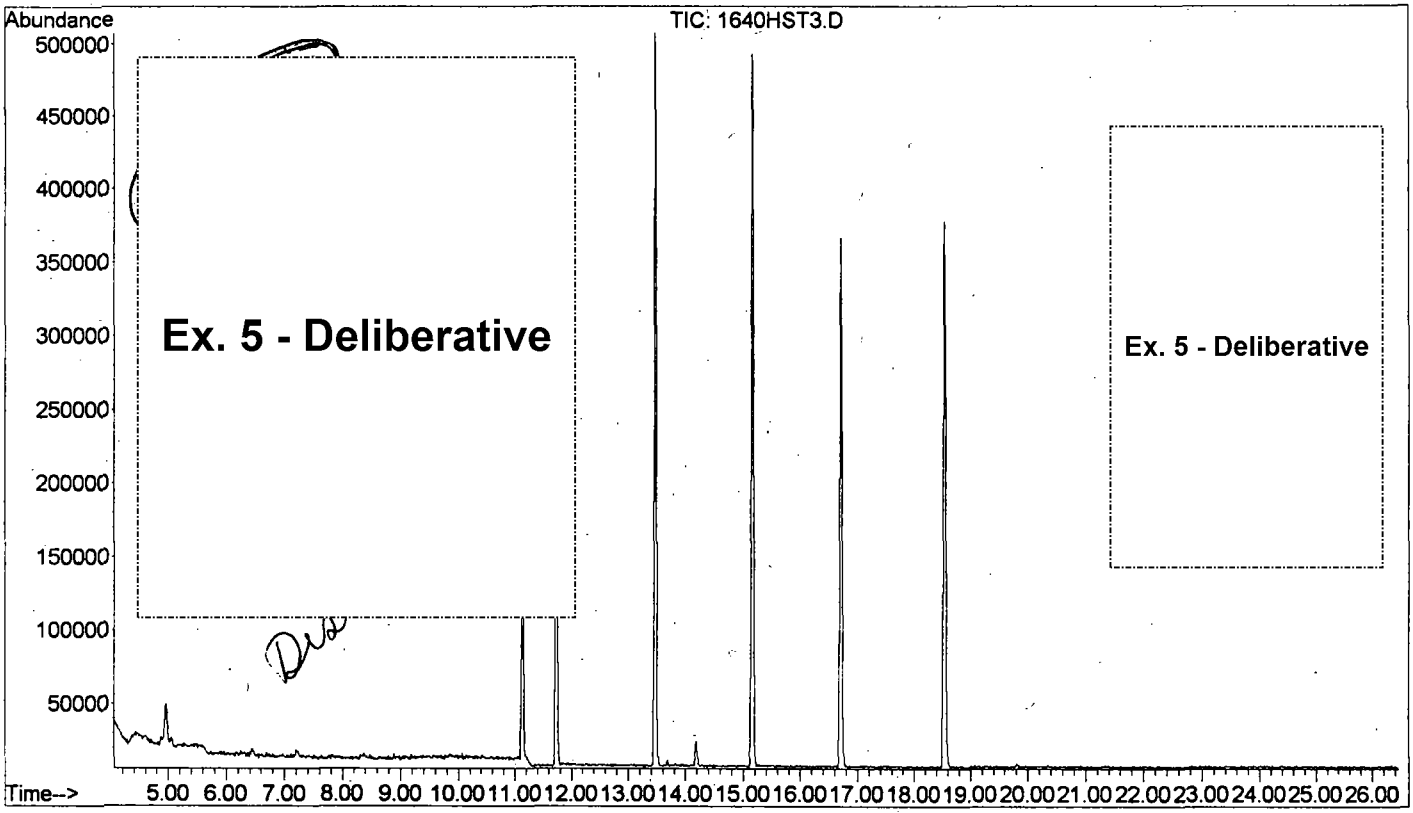


Library Searched : C:\DATABASE\NBS75K.L
Quality : 80
ID : Cyclohexane, 1,4-dimethyl-



File : C:\HPCHEM\1\DATA\012314\1640HST3.D heated
Operator : SCW
Acquired : 23 Jan 2014 2:34 pm using AcqMethod ESC
Instrument : OU-HP5972
Sample Name: 1640 PPB STD; 50 UL/100 ML MCHM;STOCK 3280PPM
Misc Info :
Vial Number: 1

Ex. 5 - Deliberative



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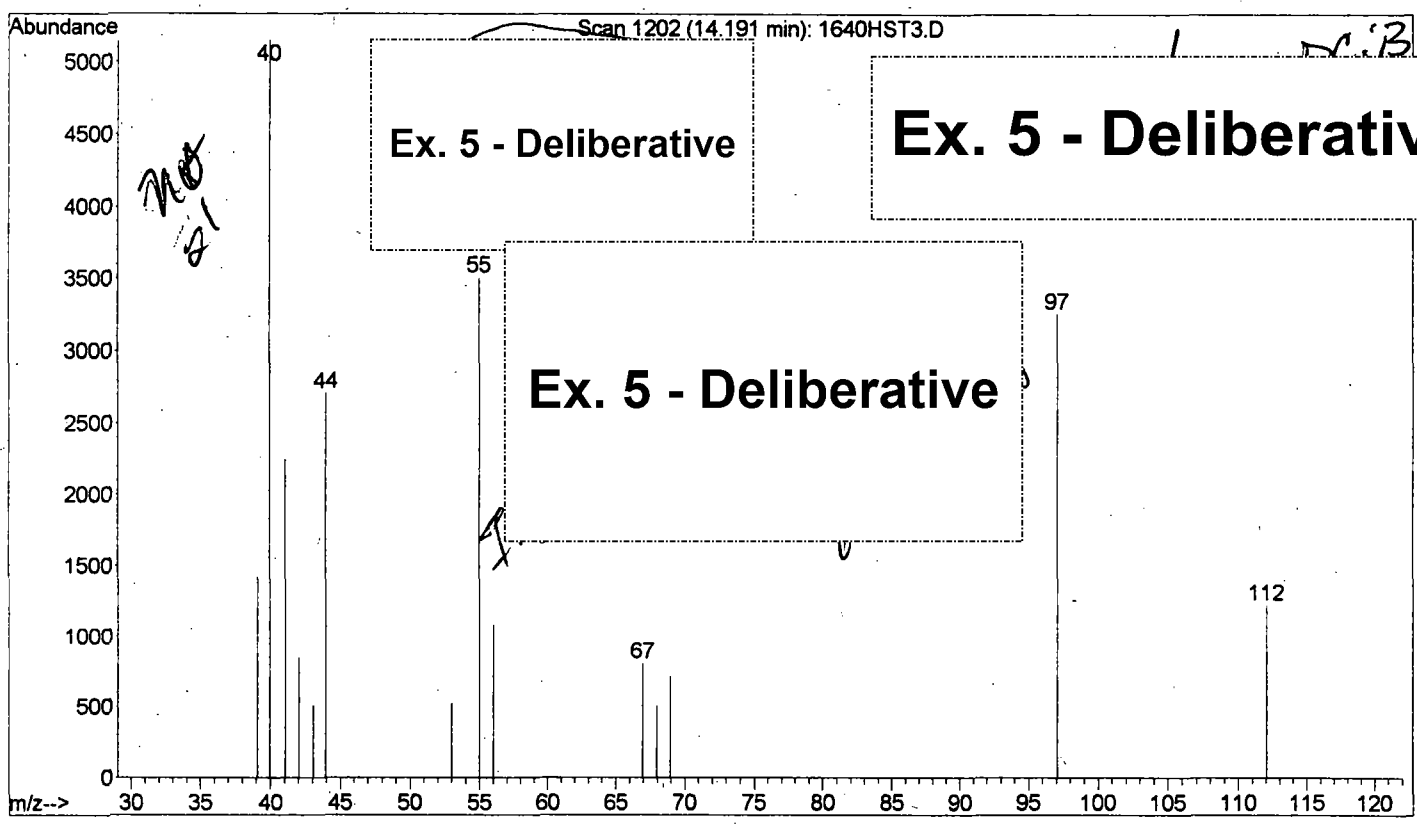

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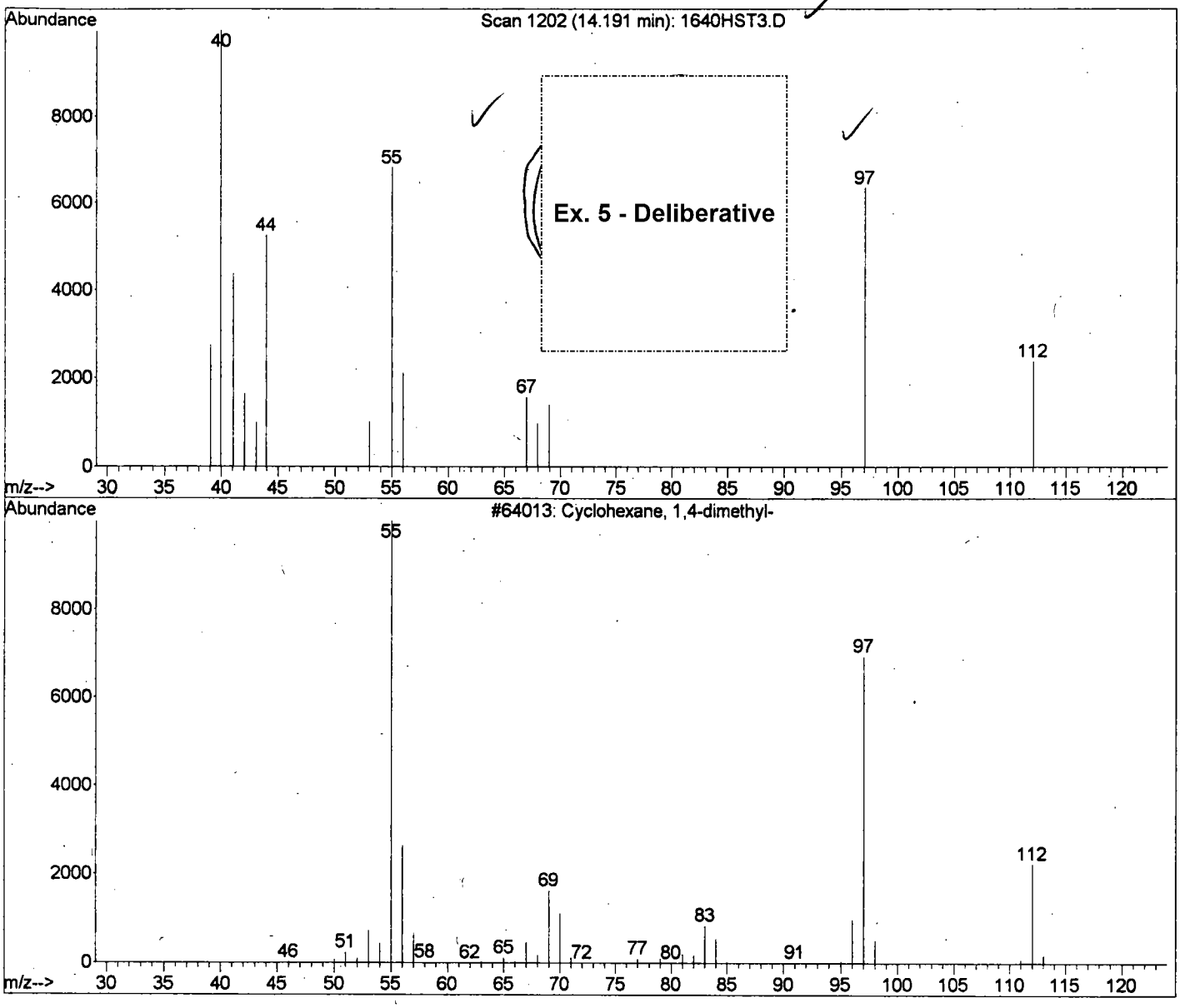
Library Searched : C:\DATABASE\NBS75K.L
Quality : 72
ID : Cyclohexane, 1,4-dimethyl-



TIC: 1640HST3.D

1640 PPB STD; 50 UL/100 ML MCHM;STOCK 3280PPM

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.960	rVB	0.110	85279	4.918	5.027
2	11.136	rVB	0.203	447747	11.086	11.288
3	11.735	rBV	0.143	740341	11.660	11.803
4	13.474	rBV	0.169	1101973	13.398	13.567
5	14.191	rVB	0.127	43328	14.132	14.258
6	15.161	rBV	0.135	1186392	15.094	15.229
7	16.714	rBV	0.143	917205	16.646	16.790
8	18.545	rVB	0.203	1050771	18.444	18.646

THE INSTITUTE REVIEW
First Quarter 2013

Assessors Reveal the Top 10 Common Onsite Assessment Findings

By Stephanie Drier, Minnesota DOH, J. Steven Gibson, TCEQ, and Carl Kircher, Florida DOH

Two out of three accredited laboratories do not demonstrate compliance with the requirements contained in the management standards for quality systems (i.e. management system). The laboratory must review the lab's management system, documentation, and records to ensure continual improvements as similarly done with the technical aspects of a laboratory. Below, the references to the 2003 NELAC and 2009 TNI Standard citations create a list of common findings made during onsite laboratory assessments:

1. **Control of Records (NELAC 5.4.12; TNI V1M2 4.13)**

   The laboratory must establish and maintain procedures to control quality and technical system records. Records are information that are created or received by the laboratory. Most findings for the control of records did not affect the data generated; however, the laboratory's record is the objective evidence that the activity occurred and as a result provides the client with data of a known and documented quality. Common citations for control of records are:

   - traceability of observations and derived data must be perform and recorded in accordance with NELAC 5.4.12.2.1 and TNI V1M2 4.13.2.1. As an example, the laboratory must record the originally observed incubator and the derived temperature data after thermometer correction factor was applied;
   - standard and reagent origin, receipt, preparation and use with analytical run logs, bench sheets, and notebooks must be maintained by the laboratory (NELAC 5.4.12.2.5.3. i and TNI V1M2 4.13.3.xi); and
   - equipment used in analytical testing is incorrectly identified or not identified in the analytical records. The laboratory must track the equipment used to produce the data and allow for historical reconstruction of the lab activities used to produce the analytical data (NELAC 5.4.12.1.5 b and TNI V1M2 4.13.3.f.

2. **Equipment (NELAC 5.5.5; TNI V1M2 5.5)**

   The laboratory must maintain support equipment in working order and must calibrate or verify the equipment annually for the entire range for which the equipment is used. The lab must also ensure to calibrate support equipment used to weigh media and soil samples, infrared temperature measuring devices, and non-class A volumetric glassware at the required frequencies. Here are two additional areas of concern for equipment and support equipment:

   - all support equipment shall be calibrated or verified annually bracketing the range of use (NELAC 5.5.5.2.1.b; TNI V1M2 5.5.13.1.b.); and
   - initial calibrations must be verified with a second source material or independently prepared lot from the same manufacturer (NELAC 5.5.5.2.2.1.d and TNI V1M4 1.7.1.1d).

3. **Quality System/Management System (NELAC 5.4.2; TNI V1M2 4.2)**

   The quality and management system requirements are defined in the Standards, and TNI offers quality system manual templates (http://www.nelac-institute.org). However, the laboratory must review and incorporate the requirements and revise the templates to reflect the actual laboratory practice. Specifically, laboratories do not define in detail the data integrity policies and procedures (NELAC 5.4.2.6; TNI V1M2 4.2.8.1), internal audits, and management review procedures. The laboratory must define within the management procedures the frequency of data integrity training for current and newly hired laboratorians, the covered topics, and training documentation. In addition, the laboratory's management system must use internal audits (see below) and management reviews (see below) to assess and improve the implemented system to ensure compliance with the requirements, such as the periodic in-depth data integrity monitoring and other laboratory policies, procedures, and processes.

Assessors Reveal the Top 10 Common Onsite Assessment Findings cont.

4. **Handling of Samples (NELAC 5.5.8; TNI V1M2 5.8)**

   The procedure for handling samples must clearly describe the process used to uniquely label all sample containers to ensure sample bottles cannot be confused physically or when referred to in records or other documents (NELAC 5.5.8.2 a; TNI V1M2 5.8.5 a).

5. **Personnel (NELAC 5.5.2; TNI V1M2 5.2)**

   The laboratory's personnel records do not include or meet standard requirements as commonly observed in the following ways:

   - initial data integrity training and the annual refresher training shall have a signature attendance sheet or other form of documentation that demonstrates all staff has participated and understand their obligations related to data integrity (NELAC 5.5.2.7; TNI VIM2 5.2.7); and
   - technical manager designations must meet requirements for both bench and academic credentials (NELAC 4.1.1.1; TNI V1M2 5.2.6.1).

6. **Management Reviews (NELAC 5.4.14; TNI V1M2 4.15)**

   - The annual review of the quality system must ensure effectiveness of the system for the size and scope of the laboratory. The laboratory management review must also assess any evidence of inappropriate actions or vulnerabilities related to data integrity (NELAC 5.4.14.1 and TNI 4.15.1);
   - The laboratory must have a predetermined schedule or maintain a procedure for the management review process (NELAC 5.4.14.2 and TNI V1M2 4.15.2); and
   - Several accredited labs conduct internal management reviews; however, the scope of the management review and required actions resulting from the review are not documented (NELAC 5.4.14.2; TNI V1M2 4.15.2).

7. **Standard Operating Procedures (NELAC 5.5.4.1.1 and 5.5.4.1.2; TNI V1M2 4.2.8.5)**

   The laboratory must provide sufficient detail within the procedures to allow someone similarly qualified, other than the analyst, to perform the test procedures and must contain information for all the laboratory activities as listed (e.g. waste management and pollution prevention) by topic in the requirements per NELAC 5.5.4.1.2 b; TNI V1M2 4.2.8.5.f.

8. **Document Control (NELAC 5.4.3; TNI V1M2 4.3)**

   The laboratory must establish and maintain procedures for approval, issuance, and change to all documents that form part of the laboratory's quality system. The laboratory must also ensure the adopted document control procedures address the following items:

   - retained obsolete documents marking process (NELAC 5.4.3.2.2 d; TNI 4.3.2.2d); and
   - control of internally generated and external source documents (e.g. regulations, standards, software specification, instruction manuals and etc.) per NELAC 5.4.3.1; TNI V1M2 4.3.1.

9. **Internal Audits (NELAC 5.4.13; TNI V1M2 4.14)**

   The laboratory's internal audit procedure must address all elements of the lab's quality system and testing activities. The quality manager must:

   - conduct internal audits of its all its activities to verify that its operations continue to comply with the requirements of the quality system and the standard requirements;

Assessors Reveal the Top 10 Common Onsite Assessment Findings cont.

- ensure that the internal audit is annually planned and conducted to adequately review all technical and management systems within the laboratory (NELAC 5.4.13.1; TNI V1M2 4.14.1).

10. Review of Requests, Tenders, and Contracts (NELAC 5.4.4.; TNI V1M2 4.4)

The contract review procedure must include the process the lab will follow to ensure that client requirements, including the method to be used, are defined, the laboratory has the resources to perform the work, and the appropriate test method is selected to meet the clients' needs.

The laboratory's contract review procedure must include a plan for subcontracting samples in case of unforeseen circumstances. The lab must maintain a register of all subcontractors that it uses and a record of their certificates/scopes of accreditation (NELAC 5.4.5.4; TNI V1M2 4.5.4).

Please review the common findings and observations to determine if your laboratory is in compliance with the standard requirements and use the listed items to evaluate and improve the health of your lab's management system.

Note: The information was compiled based on common assessment finding presentation and materials presented by the Minnesota Department of Health Environmental Laboratory Accreditation Program, the Florida Department of Health Environmental Laboratory Accreditation Program, Texas Commission on Environmental Quality, and the New York Department of Health. Finding information based on observations and findings cited from 2010 through early 2013.

Ex. 5 - Deliberative

Warner, Sue

From: Caporale, Cynthia
Sent: Friday, January 24, 2014 10:12 AM
To: Warner, Sue
Subject: Fw: ORSANCO

Here is the info. Jerry can connect you to the analyst.

Ex. 5 - Deliberative

From: Gilbert, John
Sent: Friday, January 24, 2014 9:49:10 AM
To: Caporale, Cynthia; jschulte@orsanco.org
Cc: Kelly, Jack (R3 Phila.)
Subject: ORSANCO

jerry schulte

Cindy,

Jerry's phone number is 513-231-7719 extension 104. Cell is 513-260-8249.

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Material Safety Data Sheet
The Dow Chemical Company

Product Name: DOWANOL™ PPH Glycol Ether

Issue Date: 02/11/2013
Print Date: 12 Feb 2013

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
DOWANOL™ PPH Glycol Ether

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
United States

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview
Color: colourless
Physical State: Liquid.
Odor: Very slight
Hazards of product:

WARNING! Causes eye irritation. Isolate area.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause severe eye irritation. May cause slight corneal injury.
Skin Contact: Prolonged contact may cause slight skin irritation with local redness.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: At room temperature, vapors are minimal due to low volatility. Vapor from heated material or mist may be hazardous on single exposure. For respiratory irritation and narcotic effects: No relevant data found.

Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Aspiration hazard: Based on physical properties, not likely to be an aspiration hazard.
Birth Defects/Developmental Effects: Has caused birth defects in laboratory animals only at doses toxic to the mother.

3. Composition Information

Component	CAS #	Amount
Propylene glycol phenyl ether	770-35-4	> 99.5 %

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Skin Contact: Wash skin with plenty of water.
Eye Contact: Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.
Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective. Water fog, applied gently may be used as a blanket for fire extinguishment.
Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.
Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Sand. Vermiculite. Collect in suitable and properly labeled containers. Large spills: Contain spilled material if possible. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. Handling and Storage

Handling
General Handling: Do not get in eyes. Avoid contact with skin and clothing. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.
Other Precautions: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Storage
Store in the following material(s): Carbon steel. Stainless steel. Phenolic lined steel drums. Do not store in: Aluminum. Copper. Galvanized iron. Galvanized steel.
Shelf life: Use within, Metal drums. 24 Months
Bulk 6 Months

8. Exposure Controls / Personal Protection

Exposure Limits

None established

Personal Protection
Eye/Face Protection: Use chemical goggles.
Skin Protection: Wear clean, body-covering clothing.
Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials

include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance	
Physical State	Liquid.
Color	colourless
Odor	Very slight
Odor Threshold	No test data available
pH	No test data available
Melting Point	11 °C (52 °F) *Literature*
Freezing Point	11 °C (52 °F) *Literature*
Boiling Point (760 mmHg)	241.2 °C (466.2 °F) *Literature* .
Flash Point - Closed Cup	115 °C (239 °F) *Literature*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	No
Flammable Limits In Air	**Lower**: 0.8 %(V) *Literature* **Upper**: Not determined
Vapor Pressure	0.01 hPa @ 20 °C *Literature*
Vapor Density (air = 1)	5.27 *Literature*
Specific Gravity (H2O = 1)	1.060 20 °C/20 °C *ASTM D4052*
Solubility In water (by weight)	15.1 g/l @ 20 °C *Literature*
Partition coefficient, n-octanol/water (log Pow)	1.41 *Measured*
Autoignition Temperature	1,013 hPa 480 °C (896 °F) *Literature*
Decomposition Temperature	No test data available
Dynamic Viscosity	22.7 mPa.s @ 25 °C *Literature*
Kinematic Viscosity	21.4 mm2/s *Literature*
Explosive properties	Not explosive
Oxidizing properties	No
Liquid Density	8.83 lb/gal @ 25 °C *Literature*
Molecular Weight	No test data available
Surface tension	67.8 mN/m @ 20 °C *Literature*
Henry's Law Constant (H)	4.41E-07 atm*m3/mole; 25 °C Estimated.

10. Stability and Reactivity

Reactivity
No dangerous reaction known under conditions of normal use.

Chemical stability
Thermally stable at typical use temperatures.

Possibility of hazardous reactions
Polymerization will not occur.

Conditions to Avoid: Do not distill to dryness. Product can oxidize at elevated temperatures.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials.
Decomposition products can include and are not limited to: Aldehydes. Ketones. Organic acids.

11. Toxicological Information

Acute Toxicity
Ingestion
LD50, rat > 2,000 mg/kg
Dermal
LD50, rat > 2,000 mg/kg
Inhalation
No deaths occurred following exposure to a saturated atmosphere. , 4 h, Aerosol, rat 5.4 mg/l
Eye damage/eye irritation
May cause severe eye irritation. May cause slight corneal injury.
Skin corrosion/irritation
Prolonged contact may cause slight skin irritation with local redness.
Sensitization
Skin
Did not cause allergic skin reactions when tested in guinea pigs.
Respiratory
No relevant data found.
Repeated Dose Toxicity
Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.
Chronic Toxicity and Carcinogenicity
No relevant data found.
Developmental Toxicity
Has caused birth defects in laboratory animals only at doses toxic to the mother.
Reproductive Toxicity
In animal studies, did not interfere with reproduction.
Genetic Toxicology
In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were predominantly negative.

12. Ecological Information

Toxicity

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, Pimephales promelas (fathead minnow), static test, 96 h: 280 mg/l
Aquatic Invertebrate Acute Toxicity
LC50, Daphnia magna (Water flea), static test, 48 h, survival: 370 mg/l
Aquatic Plant Toxicity
EC50, Desmodesmus subspicatus (green algae), static test, Growth rate inhibition, 72 h: > 100 mg/l

Persistence and Degradability

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation rate may increase in soil and/or water with acclimation.
OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
72 %	28 d	OECD 301F Test	fail

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
3.72E-11 cm3/s	3.5 h	Estimated.

Theoretical Oxygen Demand: 2.31 mg/mg

Bioaccumulative potential

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.41 Measured

Mobility in soil

Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 19 - 21 Estimated.
Henry's Law Constant (H): 4.41E-07 atm*m3/mole; 25 °C Estimated.

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Product Literature
Additional information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	0

Recommended Uses and Restrictions
Identified uses
Solvent for consumer and industrial applications.

Revision
Identification Number: 82587 / 0000 / Issue Date 02/11/2013 / Version: 3.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Material Safety Data Sheet
The Dow Chemical Company

Product Name: DOWANOL(TM) DiPPH Glycol Ether

Issue Date: 08/20/2012
Print Date: 14 Aug 2013

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
DOWANOL(TM) DiPPH Glycol Ether

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
United States

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview
Color: Colorless to yellow
Physical State: Liquid.
Odor: Odorless to mild
Hazards of product:

WARNING! Causes eye irritation. May be harmful if absorbed through skin. May be harmful if swallowed. Isolate area.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause severe eye irritation. May cause slight corneal injury.
Skin Contact: Brief contact may cause slight skin irritation with local redness.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Inhalation: At room temperature, vapors are minimal due to low volatility. Vapor from heated material or mist may be hazardous on single exposure. For respiratory irritation and narcotic effects: No relevant data found.
Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Aspiration hazard: Based on physical properties, not likely to be an aspiration hazard.
Birth Defects/Developmental Effects: For the major component(s): Contains component(s) which caused birth defects in laboratory animals only at doses toxic to the mother.

3. Composition Information

Component	CAS #	Amount
Dipropylene glycol phenyl ether	51730-94-0	>= 60.0 %
Propylene glycol phenyl ether	770-35-4	<= 25.0 %
Polypropylene glycol phenyl ether	28212-40-0	<= 15.0 %

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Skin Contact: Wash skin with plenty of water.
Eye Contact: Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.
Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

Maintain adequate ventilation and oxygenation of the patient. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function. Water fog, applied gently may be used as a blanket for fire extinguishment.
Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Evacuate area. Keep upwind of spill. Ventilate area of leak or spill. Only trained and properly protected personnel must be involved in clean-up operations. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Sand. Vermiculite. Collect in suitable and properly labeled containers. Large spills: Contain spilled material if possible. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. Handling and Storage

Handling
General Handling: Do not get in eyes, on skin, on clothing. Do not swallow. Avoid breathing vapor or mist. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.
Other Precautions: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Storage
Store in the following material(s): Carbon steel. Stainless steel. Phenolic lined steel drums. Do not store in: Aluminum. Copper. Galvanized iron. Galvanized steel. See Section 10 for more specific information.

Storage Period:
Bulk
6 Months

Metal drums.
24 Months

8. Exposure Controls / Personal Protection

Exposure Limits

None established

Personal Protection

Eye/Face Protection: Use chemical goggles.
Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.
Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.
Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.
Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance	
Physical State	Liquid.
Color	Colorless to yellow
Odor	Odorless to mild
Odor Threshold	No test data available
pH	Not available
Melting Point	Not applicable to liquids
Freezing Point	< -50 °C (< -58 °F) *Literature*
Boiling Point (760 mmHg)	280 °C (536 °F) *Calculated* .
Flash Point - Closed Cup	138 °C (280 °F) *Pensky-Martens Closed Cup ASTM D 93*
Evaporation Rate (Butyl Acetate = 1)	<0.01 *Literature*
Flammability (solid, gas)	Not applicable to liquids
Flammable Limits In Air	**Lower**: Not available **Upper**: Not available
Vapor Pressure	0.002 mmHg @ 20 °C *Calculated* (based on major component)
Vapor Density (air = 1)	Not available

Specific Gravity (H2O = 1)	1.0513 25 °C/25 °C *ASTM D4052*
Solubility in water (by weight)	30 g/l 1.5 % @ 25 °C *Measured*
Partition coefficient, n-octanol/water (log Pow)	No data available for this product. See Section 12 for individual component data.
Autoignition Temperature	No test data available
Decomposition Temperature	No test data available
Dynamic Viscosity	36 cps @ 25 °C *ASTM D445*
Kinematic Viscosity	34.3 cSt @ 25 °C *Calculated*
Liquid Density	1.0482 g/cm3 @ 25 °C *Digital density meter*

10. Stability and Reactivity

Reactivity
No dangerous reaction known under conditions of normal use.

Chemical stability
Thermally stable at typical use temperatures.

Possibility of hazardous reactions
Polymerization will not occur.

Conditions to Avoid: Do not distill to dryness. Product can oxidize at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Ketones. Organic acids.

11. Toxicological Information

Acute Toxicity
Ingestion
As product: Single dose oral LD50 has not been determined.
For the major component(s): LD50, rat > 2,000 mg/kg
Dermal
As product: The dermal LD50 has not been determined.
For the major component(s): LD50, rat > 2,000 mg/kg
Inhalation
As product: *The LC50 has not been determined.*
Eye damage/eye irritation
May cause severe eye irritation. May cause slight corneal injury.
Skin corrosion/irritation
Brief contact may cause slight skin irritation with local redness.
Sensitization
Skin
For the major component(s): Did not cause allergic skin reactions when tested in guinea pigs.
Respiratory
No specific, relevant data available for assessment.
Repeated Dose Toxicity
Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

Chronic Toxicity and Carcinogenicity
No specific, relevant data available for assessment.

Developmental Toxicity
For the major component(s): Contains component(s) which caused birth defects in laboratory animals only at doses toxic to the mother.

Reproductive Toxicity
For the major component(s): In animal studies, did not interfere with reproduction.

Genetic Toxicology
In vitro genetic toxicity studies were negative for component(s) tested. For the component(s) tested: Animal genetic toxicity studies were predominantly negative.

12. Ecological Information

Toxicity

Data for Component: **Dipropylene glycol phenyl ether**

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, Oncorhynchus mykiss (rainbow trout), static test, 96 h: 204 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, Daphnia magna (Water flea), static test, 48 h, immobilization: 336 mg/l
Aquatic Plant Toxicity
ErC50, Pseudokirchneriella subcapitata (green algae), Growth rate inhibition, 96 h: 188 mg/l

Data for Component: **Propylene glycol phenyl ether**

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, Pimephales promelas (fathead minnow), static test, 96 h: 280 mg/l
Aquatic Invertebrate Acute Toxicity
LC50, Daphnia magna (Water flea), static test, 48 h, survival: 370 mg/l
Aquatic Plant Toxicity
EC50, Desmodesmus subspicatus (green algae), static test, Growth rate inhibition, 72 h: > 100 mg/l

Data for Component: **Polypropylene glycol phenyl ether**

No data available.

Persistence and Degradability

Data for Component: **Dipropylene glycol phenyl ether**

Material is expected to be readily biodegradable.
OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
100 %	28 d	OECD 301F Test	pass

Data for Component: **Propylene glycol phenyl ether**

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation rate may increase in soil and/or water with acclimation.
OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
72 %	28 d	OECD 301F Test	fail

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
3.72E-11 cm3/s	3.5 h	Estimated.

Theoretical Oxygen Demand: 2.31 mg/mg

Data for Component: **Polypropylene glycol phenyl ether**
No data available.

Bioaccumulative potential

Data for Component: **Dipropylene glycol phenyl ether**
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.73 Estimated.
Bioconcentration Factor (BCF): < 1; Estimated.
Data for Component: **Propylene glycol phenyl ether**
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.41 Measured
Data for Component: **Polypropylene glycol phenyl ether**
Bioaccumulation: No data available.

Mobility in soil

Data for Component: **Dipropylene glycol phenyl ether**
Mobility in soil: Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process., Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 12.36 Estimated.
Henry's Law Constant (H): 4.77E-10 atm*m3/mole
Data for Component: **Propylene glycol phenyl ether**
Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 19 - 21 Estimated.
Henry's Law Constant (H): 4.41E-07 atm*m3/mole; 25 °C Estimated.
Data for Component: **Polypropylene glycol phenyl ether**
Mobility in soil: No data available.

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Hazard Rating System

NFPA	**Health**	**Fire**	**Reactivity**

3 1 0

Revision

Identification Number: 1062740 / 0000 / Issue Date 08/20/2012 / Version: 1.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

U.S EPA Region III Analytical Request Form

Revision 11.09

OASQA USE ONLY			
Control #	**CT6662**	**RAS #**	
DAS#	**R34313**	**NSF #**	
PES #		**Analytical TAT**	**14 days**

Date: 124/14	Site Activity: Removal Site Evaluation		
Site Name: West Virginia Chemical Leak		Street Address: 1015 Barlow Street	
City: Etowah	State: WV 25311	Latitude:	Longitude:
Program: Superfund	Acct. #: 2014 T03N303DC6A3XKRS00	CERCLIS #: Pending	
Site ID: Unknown	Spill ID: A3XK	Operable Unit: 00	
Site Specific QA Plan Submitted: ☐ No ☒ Yes	Title: Sampling QA/QC Work Plan Addendum 4		Date Approved: Oct 7, 2011
EPA Project Leader: Dennis Matlock	Phone#: 304-280-7500	Cell Phone #: 304-280-7500	E-mail: matlock.dennis@epa.gov
Request Pr: Ex. 4 - CBI	Phone#: Ex. 4 - CBI	Cell Phone #: Ex. 4 - CBI	E-mail: Ex. 4 - CBI
Site Leade:	Phone#:	Cell Phone #:	E-mail:
Contractor: TechLaw, Inc.		EPA CO/PO: Denise T. Paige /Karen Esposito	

#Samples 1	Matrix: Waste Liquid	Parameter: MCHM*; PPH** constituents	Method: OASQA SOP
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:
#Samples	Matrix:	Parameter:	Method:

Ship Date From: January 23, 2014	Ship Date To: January 23, 2014	Org. Validation Level M2	Inorg. Validation Level

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☒ Other (Specify) **14 days**

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify)

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: OSCs Raj Sharma and Melissa Linden made arrangements for analysis of sample at OASQA with Ms. Cynthia Caporale. Sample was shipped yesterday to arrive at OASQA today (1-24-14).
* crude MCHM consists of 4-methylcyclohexanemethanol and other compounds (MSDS attached).
** PPH consists of propylene glycol phenyl ether, dipropylene glycol phenyl ether, and polypropylene glycol phenyl ether (MSDS attached).

FORM ARF- 11/09 Revision

EASTMAN

MATERIAL SAFETY DATA SHEET

Revision Date: 10/19/2005
MSDSUSA/ANSI/EN/15000001^291/Version 5.0
0032691126/0004233552

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name	Crude MCHM
Product Identification Number(s)	P1871700
Manufacturer/Supplier	Eastman Chemical Company 200 South Wilcox Drive Kingsport, TN 37660-5280 US +14232292000
MSDS Prepared by	Eastman Product Safety and Health
Chemical Name	not applicable
Synonym(s)	972790
Molecular Formula	not applicable
Molecular Weight	not applicable
Product Use	industrial chemical, gasoline blending
OSHA Status	hazardous

For emergency health, safety & environmental information, call 800-EASTMAN.

For emergency transportation information, call CHEMTREC at 800-424-9300 or call 800-EASTMAN.

2. COMPOSITION INFORMATION ON INGREDIENTS

(Typical composition is given, and it may vary. A certificate of analysis can be provided, if available.)

Weight %	Component	CAS Registry No.
68 - 89%	4-methylcyclohexanemethanol	34885-03-5
4 - 22%	4-(methoxymethyl)cyclohexanemethanol	98955-27-2
4 - 10%	water	7732-18-5
5%	methyl 4-methylcyclohexanecarboxylate	51181-40-9
1%	dimethyl 1,4-cyclohexanedicarboxylate	94-60-0
1%	methanol	67-56-1
1 - 2%	1,4-cyclohexanedimethanol	105-08-8

3. HAZARDS IDENTIFICATION

WARNING!
HARMFUL IF SWALLOWED
CAUSES SKIN AND EYE IRRITATION
AT ELEVATED TEMPERATURES, VAPOR MAY CAUSE IRRITATION OF EYES AND RESPIRATORY TRACT

HMIS® Hazard Ratings: Health - 2, Flammability -1, Chemical Reactivity - 0

HMIS® rating involves data interpretations that may vary from company to company. They are intended only for rapid, general identification of the magnitude of the specific hazard. To deal adequately with the safe handling of this material, all the information contained in this MSDS must be considered.

4. FIRST-AID MEASURES

Inhalation: Move to fresh air. Treat symptomatically. Get medical attention if symptoms persist.
Eyes: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention. In case of irritation from airborne exposure, move to fresh air. Get medical attention if symptoms persist.
Skin: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
Ingestion: Call a physician or poison control center immediately. Only induce vomiting at the instruction of medical personnel. Never give anything by mouth to an unconsious person.

5. FIRE FIGHTING MEASURES

Extinguishing Media: water spray, dry chemical, carbon dioxide, alcohol foam
Special Fire-Fighting Procedures: Wear self-contained breathing apparatus and protective clothing.
Hazardous Combustion Products: carbon dioxide, carbon monoxide
Unusual Fire and Explosion Hazards: none

6. ACCIDENTAL RELEASE MEASURES

Use personal protective equipment. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste.
For Large Spills: Flush spill area with water spray. Prevent runoff from entering drains, sewers, or streams.

7. HANDLING AND STORAGE

Personal Precautionary Measures: Avoid breathing vapor from heated material. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling.
Prevention of Fire and Explosion: Keep from contact with oxidizing materials.
Storage: Keep container closed. Keep away from food, drink and animal foodstuff.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Country specific exposure limits have not been established or are not applicable unless listed below.

METHANOL

US. ACGIH Threshold Limit Values
Time Weighted Average (TWA): 200 ppm,
US. ACGIH Threshold Limit Values
Short Term Exposure Limit (STEL): 250 ppm,
US. ACGIH Threshold Limit Values
Skin designation: Can be absorbed through the skin.

METHYL ALCOHOL

US. NIOSH: Pocket Guide to Chemical Hazards
Recommended exposure limit (REL): 200 ppm, 260 mg/m3
US. NIOSH: Pocket Guide to Chemical Hazards
Short Term Exposure Limit (STEL): 250 ppm, 325 mg/m3
US. NIOSH: Pocket Guide to Chemical Hazards
Skin designation: Can be absorbed through the skin.

METHYL ALCOHOL; METHANOL

US. California Code of Regulations, Title 8, Sec tion 5155. Airborne Contaminants
Time Weighted Average (TWA) Permissible Exposure Limit (PEL): 200 ppm, 260 mg/m3
US. California Code of Regulations, Title 8, Sec tion 5155. Airborne Contaminants
Ceiling Limit Value: 1,000 ppm,
US. California Code of Regulations, Title 8, Sec tion 5155. Airborne Contaminants
Short Term Exposure Limit (STEL): 250 ppm, 325 mg/m3
US. California Code of Regulations, Title 8, Sec tion 5155. Airborne Contaminants
Skin designation: Can be absorbed through the skin.

METHYL ALCOHOL

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
PEL: 200 ppm, 260 mg/m3

Ventilation: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA Standard 63 FR 1152, January 8, 1998. Respirator type: Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

Eye Protection: Wear safety glasses with side shields (or goggles). Wear a full-face respirator, if needed.

Skin Protection: Wear chemical-resistant gloves, footwear, and protective clothing appropriate for the risk of exposure. Contact health and safety professional or manufacturer for specific information.

Recommended Decontamination Facilities: eye bath, safety shower, washing facilities

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form: liquid
Color: colorless

Odor: alcohol
Specific Gravity: < 1estimated
Freezing Point: 0 °C
Boiling Point: 180 °C
Solubility in Water: appreciable
Flash Point: 112.8 °C (Setaflash closed cup)
Thermal Decomposition Temperature: Thermal stability not tested. Low stability hazard expected at normal operating temperatures.

10. STABILITY AND REACTIVITY

Stability:	Not fully evaluated. Materials containing similar structural groups are normally stable.
Incompatibility:	Material reacts with strong oxidizing agents.
Hazardous Polymerization:	Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute toxicity data, if available, are listed below. Additional toxicity data may be available on request.

Oral LD-50:(rat)	825 mg/kg
Dermal LD-50: (rat)	> 2,000 mg/kg (only dose tested)
Skin Irritation (rabbit)	strong
Skin Sensitization: (guinea pig)	none

12. ECOLOGICAL INFORMATION

Acute toxicity data, if available, are listed below. Additional toxicity data may be available on request.
Oxygen Demand Data:
BOD-5: 70 mg/g
BOD-20: 1,300 mg/g

COD: 2,540 mg/g

Acute Aquatic Effects Data:
96 h LC-50 (fathead minnow): 57.4 mg/l NOEC: 25 mg/l
48 h EC-50 (daphnid): 98.1 mg/l NOEC: 40 mg/l

13. DISPOSAL CONSIDERATIONS

Discharge, treatment, or disposal may be subject to national, state, or local laws. Incinerate.

14. TRANSPORT INFORMATION

Important Note: Shipping descriptions may vary based on mode of transport, quantities, package size, and/or origin and destination. Consult your company's Hazardous Materials/Dangerous Goods expert for information specific to your situation.

DOT (USA)

Class not regulated

Sea - IMDG (International Maritime Dangerous Goods)

Class not regulated

Air - ICAO (International Civil Aviation Organization)

Class not regulated

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.
WHMIS (Canada) Status: controlled

WHMIS (Canada) Hazard Classification: D/2/B

SARA 311-312 Hazard Classification(s):
immediate (acute) health hazard

SARA 313: none, unless listed below
METHANOL

Carcinogenicity Classification (components present at 0.1% or more): none, unless listed below

TSCA (US Toxic Substances Control Act): All components of this product are listed on the TSCA inventory. Any impurities present in this product are exempt from listing.

DSL (Canadian Domestic Substances List) and CEPA (Canadian Environmental Protection Act): One or more components of this product are not listed on the DSL. In Canada, its use is restricted to research and development purposes only.

EINECS (European Inventory of Existing Commercial Chemical Substances): One or more components or reactants of this product are not listed on EINECS. In the European Union, its use is restricted to research and development purposes only.

MITI (Japanese Handbook of Existing and New Chemical Substances): One or more components or reactants of this product are not listed in the Handbook. In Japan, its use is restricted to research and development purposes only.

ECL (Korean Toxic Substances Control Act): One or more components of this product are not listed on the Korean inventory. In Korea, its use is restricted to research and development purposes only.

16. OTHER INFORMATION

Visit our website at www.EASTMAN.com or call 001-423-229-2000.

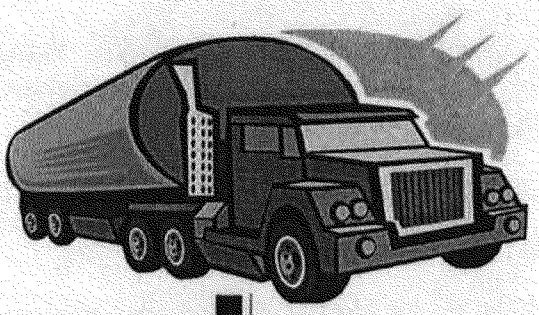
The information contained herein is based on current knowledge and experience; no responsibility is accepted that the information is sufficient or correct in all cases. Users should consider these data only as a supplement to other information. Users should make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials, the safety and health of employees and customers, and the protection of the environment.

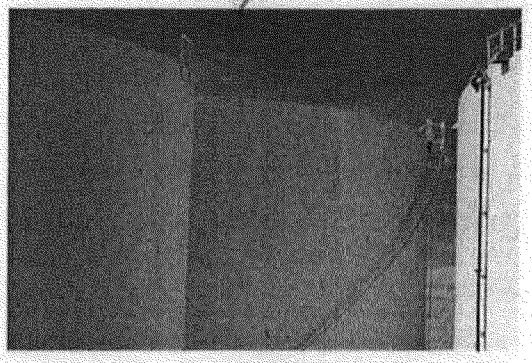
Highlighted areas indicate new or changed information.

Attachment B

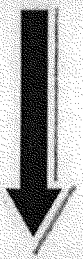
Process Flow Diagram - MCHM

Product is delivered

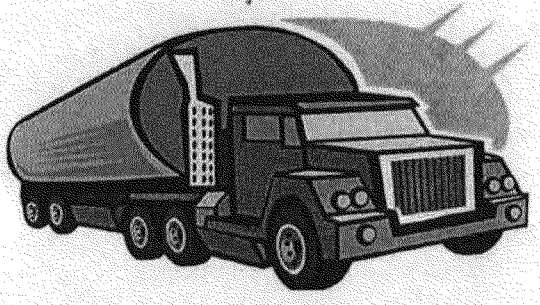




Pumped to a storage tank



Pumped out of the tank
For delivery to customers



Attachment C

Process Description

ERT receives tank trailer shipment of raw materials. These materials are pumped to the appropriate storage tank. MCHM, is shipped to customers, in bulk tank trailers, without further processing.

Glycerin is occasionally shipped, in bulk tank trailers, without further processing. Usually, however, glycerin is pumped to another large storage tank, mixed with water and other ingredients to meet customer specifications, and shipped in bulk tank trailers.

Occasionally, high pH glycerin is received. Hydrochloric acid is used to lower the pH. The hydrochloric acid is metered into the glycerin through a closed-loop addition system. Only enough hydrochloric acid is ordered to neutralize the glycerin on-hand. The hydrochloric acid is never stored for more than a few days.

Material Safety Data Sheet

The Dow Chemical Company

Product Name: PPH, Basic

Issue Date: 11/15/2011
Print Date: 16 Nov 2011

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
PPH, Basic

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview

Color: Colorless to yellow
Physical State: Liquid.
Odor: Mild
Hazards of product:

DANGER! Causes severe eye burns. Causes severe skin burns. Causes burns of the mouth and throat. Causes respiratory tract irritation. Aspiration hazard. Can enter lungs and cause damage. Evacuate area. Keep upwind of spill.

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects

Eye Contact: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.
Skin Contact: Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: At room temperature, vapors are minimal due to low volatility. Vapor from heated material or mist may be hazardous on single exposure. Mist may cause severe irritation of upper respiratory tract (nose and throat).
Ingestion: Low toxicity if swallowed. Swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract.
Aspiration hazard: Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

3. Composition Information

Component	CAS #	Amount
Dipropylene glycol phenyl ether	51730-94-0	<= 85.0 %
Propylene glycol phenyl ether	770-35-4	<= 30.0 %
Propoxylated Impurities	Not applicable	<= 10.0 %
2-Hydroxy-alpha-methyl-benzeneethanol	33206-31-4	<= 5.0 %
2-Hydroxy-beta-methyl-benzeneethanol	134342-25-9	<= 5.0 %
Polypropylene glycol phenyl ether	28212-40-0	<= 5.0 %
Sodium hydroxide	1310-73-2	>= 0.0 - <= 5.0 %

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing. Seek medical attention if symptoms occur or irritation persists. Wash clothing before reuse. Suitable emergency safety shower facility should be immediately available.
Eye Contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.
Ingestion: Do not induce vomiting. Give one cup (8 ounces or 240 ml) of water or milk if available and transport to a medical facility. Do not give anything by mouth unless the person is fully conscious.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

Maintain adequate ventilation and oxygenation of the patient. Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. If burn is present, treat as any thermal burn, after decontamination. Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function. Water fog, applied gently may be used as a blanket for fire extinguishment.
Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Evacuate area. Keep upwind of spill. Ventilate area of leak or spill. Only trained and properly protected personnel must be involved in clean-up operations. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Sand. Vermiculite. Collect in suitable and properly labeled containers. Large spills: Contain spilled material if possible. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. Handling and Storage

Handling

General Handling: Do not get in eyes, on skin, on clothing. Do not swallow. Avoid breathing vapor or mist. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.
Other Precautions: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Storage

Store in the following material(s): Carbon steel. Stainless steel. Phenolic lined steel drums. Do not store in: Aluminum. Copper. Galvanized iron. Galvanized steel. See Section 10 for more specific information.

Storage Period:
Bulk
6 Months
Metal drums.
24 Months

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Sodium hydroxide	ACGIH	Ceiling	2 mg/m3
	OSHA Table Z-1	PEL	2 mg/m3

Personal Protection

Eye/Face Protection: Use chemical goggles.
Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.
Ingestion: Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

Engineering Controls

Ventilation: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance

Physical State	Liquid.
Color	Colorless to yellow
Odor	Mild
Odor Threshold	No test data available
pH	No test data available
Melting Point	No test data available
Freezing Point	< 0 °C (< 32 °F) *Literature*
Boiling Point (760 mmHg)	247 °C (477 °F) *Literature* .
Flash Point - Closed Cup	123 °C (253 °F) *Setaflash Closed Cup ASTMD3278*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Vapor Pressure	0.0155 mmHg @ 25 °C *Literature*
Vapor Density (air = 1)	No test data available
Specific Gravity (H2O = 1)	1.0578 25 °C/25 °C *Literature*
Solubility in water (by weight)	2 % @ 25 °C *Literature*
Partition coefficient, n-octanol/water (log Pow)	No data available for this product. See Section 12 for individual component data.
Autoignition Temperature	No test data available
Decomposition Temperature	No test data available
Dynamic Viscosity	25.7 cps @ 25 °C *Literature*
Kinematic Viscosity	No test data available

10. Stability and Reactivity

Reactivity
No dangerous reaction known under conditions of normal use.

Chemical stability
Thermally stable at typical use temperatures.

Possibility of hazardous reactions
Polymerization will not occur.

Conditions to Avoid: Do not distill to dryness. Product can oxidize at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Ketones. Organic acids.

11. Toxicological Information

Acute Toxicity
Ingestion
As product: Single dose oral LD50 has not been determined.
For the major component(s): LD50, rat > 2,000 mg/kg
Dermal
As product: The dermal LD50 has not been determined.
For the major component(s): LD50, rabbit > 2,000 mg/kg

Inhalation
As product: The LC50 has not been determined.

Eye damage/eye irritation
May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

Skin corrosion/irritation
Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Sensitization
Skin
For the major component(s): Did not cause allergic skin reactions when tested in guinea pigs.
Respiratory
No specific, relevant data available for assessment.

Repeated Dose Toxicity
Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

Chronic Toxicity and Carcinogenicity
No specific, relevant data available for assessment.

Developmental Toxicity
No specific, relevant data available for assessment.

Reproductive Toxicity
No specific, relevant data available for assessment.

Genetic Toxicology
In vitro genetic toxicity studies were negative for component(s) tested. For the component(s) tested: Animal genetic toxicity studies were predominantly negative.

12. Ecological Information

Toxicity

Data for Component: **Dipropylene glycol phenyl ether**
Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, rainbow trout (Oncorhynchus mykiss), static, 96 h: 204 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, water flea Daphnia magna, static test, 48 h, immobilization: 336 mg/l
Aquatic Plant Toxicity
ErC50, Pseudokirchneriella subcapitata (green algae), Growth rate inhibition, 96 h: 188 mg/l

Data for Component: **Propylene glycol phenyl ether**
Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, Pimephales promelas (fathead minnow), static, 96 h: 280 mg/l
Aquatic Invertebrate Acute Toxicity
LC50, water flea Daphnia magna, static test, 48 h, survival: 370 mg/l
Aquatic Plant Toxicity
EC50, Desmodesmus subspicatus (green algae), static test, Growth rate inhibition, 72 h: > 100 mg/l

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**
No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**
No data available.

Data for Component: **Polypropylene glycol phenyl ether**
No data available.

Data for Component: **Sodium hydroxide**

May increase pH of aquatic systems to > pH 10 which may be toxic to aquatic organisms.

Persistence and Degradability

Data for Component: **Dipropylene glycol phenyl ether**

Material is expected to be readily biodegradable.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
100 %	28 d	OECD 301F Test	pass

Data for Component: **Propylene glycol phenyl ether**

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
Biodegradation rate may increase in soil and/or water with acclimation.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
72 %	28 d	OECD 301F Test	fail

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
3.72E-11 cm3/s	3.5 h	Estimated.

Theoretical Oxygen Demand: 2.31 mg/mg

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**

No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**

No data available.

Data for Component: **Polypropylene glycol phenyl ether**

No data available.

Data for Component: **Sodium hydroxide**

Biodegradation is not applicable.

Bioaccumulative potential

Data for Component: **Dipropylene glycol phenyl ether**

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.73 Estimated.
Bioconcentration Factor (BCF): < 1; Estimated.

Data for Component: **Propylene glycol phenyl ether**

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.41 Measured

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**

Bioaccumulation: No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**

Bioaccumulation: No data available.

Data for Component: **Polypropylene glycol phenyl ether**

Bioaccumulation: No data available.

Data for Component: **Sodium hydroxide**

Bioaccumulation: No bioconcentration is expected because of the relatively high water solubility.

Mobility in soil

Data for Component: **Dipropylene glycol phenyl ether**

Mobility in soil: Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process., Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 12.36 Estimated.
Henry's Law Constant (H): 4.77E-10 atm*m3/mole

Data for Component: **Propylene glycol phenyl ether**

Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 19 - 21 Estimated.
Henry's Law Constant (H): 4.41E-07 atm*m3/mole; 25 °C Estimated.

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**

Mobility in soil: No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**

Mobility in soil: No data available.

Data for Component: **Polypropylene glycol phenyl ether**

Mobility in soil: No data available.

Data for Component: **Sodium hydroxide**

Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 14 Estimated.

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE
Hazard Class: 8 **ID Number:** UN 3267 **Packing Group:** PG II

DOT Bulk
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE
Hazard Class: 8 **ID Number:** UN 3267 **Packing Group:** PG II

IMDG
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE
Hazard Class: 8 **ID Number:** UN3267 **Packing Group:** PG II
EMS Number: F-A,S-B
Marine pollutant.: No

ICAO/IATA
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE

Hazard Class: 8 **ID Number:** UN3267 **Packing Group:** PG II
Cargo Packing Instruction: 855
Passenger Packing Instruction: 851
Additional Information

Reportable quantity: 20,000 lb – SODIUM HYDROXIDE

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Sodium hydroxide	1310-73-2	>= 0.0 - <= 5.0 %

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Product Literature

Additional information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure. Additional information on this and other products may be obtained by visiting our web page.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	3	1	0

Recommended Uses and Restrictions

Identified uses

Industrial solvent. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

Revision

Identification Number: 1010291 / 0000 / Issue Date 11/15/2011 / Version: 7.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Warner, Sue

From: Wilding, Stevie
Sent: Friday, January 24, 2014 1:38 PM
To: Caporale, Cynthia; Costas, Robin; Curry, John; Gundersen, Jennifer; Graybill, Eric; Molnar, Adam; Warner, Sue
Subject: R34313 West Virginia Chemical Leak -- Project Creation
Attachments: Stevie Wilding.vcf

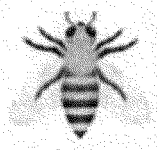
I did create a project.

Ex. 5 - Deliberative

The analysis were

- **Ex. 5 - Deliberative**
-
-

Other possibilities are VOAs and IR. Not sure metals would be good to look at.



Stevie Wilding
US EPA Region III, OASQA
Chemist

410-305-2606 Work
Wilding.Stevie@epa.gov

Environmental Science Center
701 Mapes Road
Fort Meade, MD 20755

Warner, Sue

From: Foreman, William [wforeman@usgs.gov]
Sent: Friday, January 24, 2014 4:31 PM
To: Caporale, Cynthia; Warner, Sue
Cc: Zawodny, Peggy; Donna Rose
Subject: 4-MCHM standard

Hi Cindy and Sue

Thanks again for sending us the 4-MCHM standard and crude MCHM, and for sharing most helpful analysis info.

We also finally received our standard from TCI America today. Batch (lot) is RCGNA-BH.
What is the batch # of the material you sent us?

Donna got 2 peaks separated by ~0.6 m with excellent response at 50 ppb in full scan using 65C heated P&T, and perfect match with NIST library. She will be sharing with you the operational conditions.

Do you know or have you heard from the ERT lab which isomer elutes first?

Bill

William T. Foreman, Ph.D.
Research Chemist
Methods Research and Development Program
U.S. Geological Survey
National Water Quality Laboratory
P.O. Box 25585
Denver, CO 80225-0585
{For Fedex, delete Box number and add Bldg. 95, Entrance E3}
303-236-3942; FAX: 303-236-3499
email: wforeman@usgs.gov

Warner, Sue

From: Rose, Donna [dlrose@usgs.gov]
Sent: Friday, January 24, 2014 4:40 PM
To: Foreman, William
Cc: Warner, Sue; Caporale, Cynthia; Zawodny, Peggy; Donna Rose; John Zogorski; Duane Wydoski; Lucinda Murtagh; David Reppert
Subject: Re: purge conditions
Attachments: Table.5.4437.OperatingCond.April28.xlsx

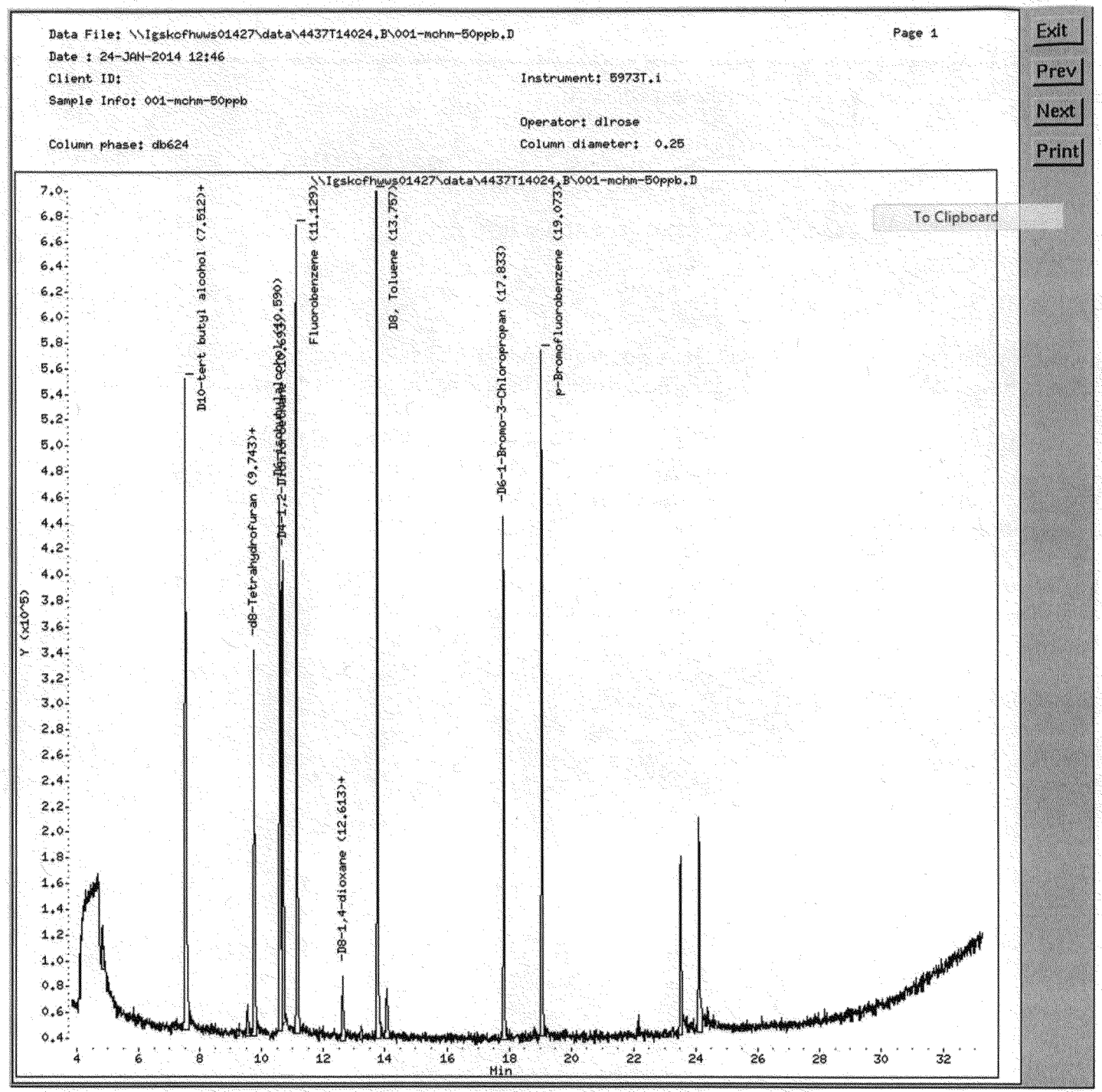
Hi Everyone

I got the standard in for 4-methyl-1-cyclohexanemethane and ran a 50 ug/L standard on my system. The mass spec is in full scan/sim simultanous mode. The operating conditions are listed in the attached excel file.

I got two peaks, one at 23.514 minutes and one at 24.094 minutes. Both matched the NIST reference spectra beautifully. I don't know which peak is the cis isomer and which is the trans isomer. TCI had a purity of 99.8% for the total isomer purity. I left a message with technical support to see if they had additional information on the percentages of each isomer.

The response is beautiful in the full scan mode. The second peak is slightly bigger than the first but not by much. The two peaks at the end of the chromatogram are the MCHM isomers.

full scan data file



Donna Rose, Chemist
U. S. Geological Survey
303-236-3283

On Thu, Jan 23, 2014 at 3:19 PM, Foreman, William <wforeman@usgs.gov> wrote:
Sue,
Thanks for the info and call. We'll let you know how it goes for us.
Bill

On Thu, Jan 23, 2014 at 2:36 PM, Warner, Sue <Warner.Sue@epa.gov> wrote:

Recommended Operating Conditions for Purge and Trap Apparatus for Volatiles in Soil Analysis (Low Level) Using the Archon Autosampler

Operating Parameter	Setting
Sample Type	Soil
Sample Volume	5 or 10 mL (adds 5 or 10 mL: 10 mL for samples and blanks and 5 mL for standards and spikes)
Rinse Volume	25 mL
Number of Rinses	2
Standard 1	Yes
Standard 2	No
Soil Preheat Stir	Yes
Stir	Yes
Syringe Flushes	2
Preheat	Yes
Preheat Temperature	40 °C
Preheat Time	1.5 min.
Purge Time	11.0 min.
Desorb Time	2.0 min
Operational Mode	Remote
Cycle Timer	38.3 min
Aux Time	0.0 min
Purge Gas Pressure	20 psi
Flow	35-40 mL/min

The trap used is a VOCARB 3000.

From: Caporale, Cynthia
Sent: Thursday, January 23, 2014 4:18 PM
To: Warner, Sue; Zawodny, Peggy
Subject: FW: purge conditions

FYI – feel free to speak to the voc analyst directly or if you want a conference call I'd be willing to help set one up.

From: Foreman, William [mailto:wforeman@usgs.gov]
Sent: Thursday, January 23, 2014 4:10 PM
To: Caporale, Cynthia
Cc: Donna Rose; William Foreman
Subject: purge conditions

Hi Cindy,

I'd appreciate your checking with your P&T analyst regarding the following conditions used:

purge temp

purge time

purge volume

type of trap

I've cc'd our lead VOC analyst, Donna Rose. If your analyst has time for a brief call today or tomorrow, please have them call Donna at 303-236-3283. Or we can set a time and do it as a conference call.

If you happen to have any handy details about the ERT mobile lab's method, that would be helpful.

We greatly appreciate the help/guidance!

Bill

William T. Foreman, Ph.D.

Research Chemist
Methods Research and Development Program

U.S. Geological Survey
National Water Quality Laboratory
P.O. Box 25585
Denver, CO 80225-0585
{For Fedex, delete Box number and add Bldg. 95, Entrance E3}
303-236-3942; FAX: 303-236-3499
email: wforeman@usgs.gov

--

Donna L. Rose
Chemist
dlrose@usgs.gov
U.S. Geological Survey
National Water Quality Laboratory
303-236-3283 phone
303-236-3499 fax

Warner, Sue

From: Caporale, Cynthia
Sent: Wednesday, January 22, 2014 10:42 AM
To: Zawodny, Peggy; Warner, Sue; Graybill, Eric; Gundersen, Jennifer
Cc: Poff, Kevin; Molnar, Adam
Subject: URGENT - FW: WV Chemical Spill - urgent
Importance: High

workplace.epa.gov

We are being asked to characterize PPH to at least see if these compounds will show up using GC/MS (would the existing analysis for DW samples have seen this as a TIC?). We are probably going to be asked to do samples so I need an assessment of where we are and how soon we could be ready either for MCHM or PPH.

Some PPH is being shipped to us for Friday delivery.

I would like a call/meeting at 11:30am today. I will try to set up a conference line for those at home.

-----Original Message-----
From: Wisniewski, Patti-Kay
Sent: Wednesday, January 22, 2014 9:40 AM
To: Caporale, Cynthia
Subject: FW: WV Chemical Spill - urgent
Importance: High

See last item. Shawn is asking questions about whether GC/MS would also identify PPH, Can you do analysis for this? are you geared up to do MCHM?
Not sure anyone has samples to send you, even if ready.

Patti Kay
best to call home number today, office closed, 856-854-1547

From: Capacasa, Jon
Sent: Tuesday, January 21, 2014 7:30 PM
To: Arguto, William; Wisniewski, Patti-Kay
Subject: Fw: WV Chemical Spill - urgent

Please take a look at this request and let me know of any actions we are aware of.

From: Deputy Administrator
Sent: Tuesday, January 21, 2014 7:28:40 PM
To: Garvin, Shawn; Keyes-Fleming, Gwendolyn; Stanislaus, Mathy; Feldt, Lisa; Ganesan, Arvin; Reynolds, Thomas; Johnson, Alisha; Stoner, Nancy; Vaught, Laura; Distefano, Nichole; Hull, George; Stanton, Larry; Breen, Barry; Giles-AA, Cynthia; Hedman, Susan; Meiburg, Stan; Fritz, Matthew; Garbow, Avi; Jones, Jim; Behringer, Caroline
Cc: Early, William; Hodgkiss, Kathy; Capacasa, Jon; Ryan, Daniel
Subject: Re: WV Chemical Spill - urgent

Ex. 5 - Deliberative

We are fielding press calls about this "new" chemical and when we knew and why we didn't know or reveal before.

Ex. 5 - Deliberative

Call me or Caroline Behringer

Bob
Deputy Administrator
202 368 8193 (c)
202 564 4711 (o)
From: Garvin, Shawn
Sent: Tuesday, January 21, 2014 5:32 PM
To: Adm13McCarthy, Gina; Deputy Administrator; Keyes-Fleming, Gwendolyn; Stanislaus, Mathy; Feldt, Lisa; Ganesan, Arvin; Reynolds, Thomas; Johnson, Alisha; Stoner, Nancy; Vaught, Laura; Distefano, Nichole; Hull, George; Stanton, Larry; Breen, Barry; Giles-AA, Cynthia; Hedman, Susan; Meiburg, Stan; Fritz, Matthew; Garbow, Avi; Jones, Jim
Cc: Early, William; Hodgkiss, Kathy; Capacasa, Jon; Ryan, Daniel
Subject: WV Chemical Spill - Update

FYI - Here the update from today. Pay special attention to the last item. Trying to get more information. Thx

Water Supply

West Virginia American Water Company is continuing flushing and re-sampling until the samples show a non-detect level throughout the distribution system. Labs that are available to measure down to the non-detect level could be an issue. The flushing and sampling will continue until all areas are determined to be at a non-detect level.

Source Protection

The Region's OSCs reported that work continues to contain water coming from the upgradient source. A hole was excavated near the front gate to determine the origin of the water. The water, which is clean, will be pumped into the tank containing the glycerin sludge to dilute the sludge, which should ease pumping the glycerin. The glycerin will be hauled to customers to comply with the WVDEP order. An updated inventory of the remaining chemicals will be provided to the WVDEP tomorrow.

The booms on the river appear in good condition and are not collecting any visible material. No visible sheen was seen on the river behind the booms.

Soil removal is delayed due to the cold temperatures and snow fall. The WVDEP requested that the contractor look at the north end of the trench where the poly sheeting has folded back and needs to be repaired. The facility's contractor will inspect the river boom to break up the ice and stop ice from forming during the lowering temperatures throughout the week. This will prevent the ice from becoming a conduit if there was an additional release.

The Chapter 11 court hearing has delayed shipment of the Baker double-walled tankers. The tankers will not be released until after today's court appearance. The filing is extremely important for Freedom Industries to continue to operate and continue to meet WVDEP's requirements. If they are unable to proceed with Chapter 11 filing for reorganization, then Freedom Industries will have to file Chapter 7 and discontinue the removal work.

The remediation contractor, Civil Environmental Consultants, has begun to work on a plan for the site. They stated that the cost or scope of remediation work will not be cost prohibitive due to deterioration of the product and the clay base under the site that kept the chemical from infiltrating deep into the ground.

Developing Issue (Still working on more information)

Freedom Industries advised the OSCs today there was a mixture in Tank 396, instead of just MCHM, as was previously reported. The mixture was approximately 5.6% of PPH (Poly glycol ether), described in an MSDS sheet provided by Freedom Industries. 300 gallons of the PPH along with 6251 gallons of MCHM comprised what is believed to be the total release (including what is still in the soil and what made it to the river). ATSDR is on alert to evaluate this particular chemical, after we make available to them any toxicological studies that the Regional Toxicologist may be able to access. According to the MSDS sheet, the substance is a skin and eye irritant. cause of NaOH

Glycol Ether is a listed hazardous substance associated with the CAA as its statutory source (with no reportable quantity, so the default would likely be 10K pounds). We are continuing to evaluate this situation.

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

SDS REVISION #: 001

PRODUCT IDENTIFIER: PPH, stripped

OTHER IDENTIFIERS: None

CHEMICAL FORMULA: Complex mixture

5.6% in MCHM

RELEVANT USES: Mineral flotation

DISTRIBUTED BY: Freedom Industries, Inc.
1015 Barlow Drive
Charleston, WV 25311

PHONE NUMBERS: Business - (304) 720-8065 (business hours)
CHEMTREC - (800) 424-9300 (transportation emergencies)

SECTION 2 - HAZARDS IDENTIFICATION

GHS CLASSIFICATION:
Serious eye irritation (Category 2)
Skin irritation (Category 2)

SIGNAL WORD:
Warning!

HAZARD STATEMENTS:
Causes skin irritation and serious eye irritation.

PRECAUTIONARY STATEMENTS:

Prevention
Wear protective gloves, eye protection and face protection. Wash exposed areas thoroughly after handling.

Response
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. If on skin: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse.

Section 2 continued on next page

SECTION 2 - HAZARDS IDENTIFICATION (continued)

PRECAUTIONARY STATEMENTS (continued):

Storage
Not applicable

Disposal
Not applicable

Ex. 5 - Deliberative

HAZARDS NOT OTHERWISE CLASSIFIED: None

SECTION 3 - COMPOSITION / INFORMATION ON INGREDIENTS

Component	%	CAS No.
Polyglycol ethers	100	Proprietary*

*The specific chemical identity is being withheld as "trade secret" in accordance with 29 CFR 1910.1200(i)

SECTION 4 - FIRST AID MEASURES

IN CASE OF EYE CONTACT:
Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids occasionally. Remove contact lenses, if present and easy to do. Get immediate medical attention. Do not use chemical antidote.

IN CASE OF SKIN CONTACT:
Wash exposed area with soap and water. Remove contaminated clothing and launder before reuse.

IF SWALLOWED:
If conscious, immediately give two large glasses of water. Call a physician. Never give anything by mouth to an unconscious person.

IF INHALED:
If affected, move to fresh air. If breathing is difficult, contact a physician.

MOST IMPORTANT SYMPTOMS AND EFFECTS:
Contact with skin or eyes causes irritation, which may be severe, especially in sensitive individuals.

NOTE TO PHYSICIAN:
Treat symptomatically.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

This material is not easily ignited, but will burn if heated sufficiently. It meets the OSHA definition of a Class IIIB – combustible liquid.

EXTINGUISHING MEDIA:

Use water fog, alcohol-resistant foam or dry chemical or carbon dioxide.

PROTECTION OF FIREFIGHTERS:

Keep personnel removed from and upwind. Wear full protective clothing and self-contained breathing apparatus with full face-piece. Cool containers with water. Water or foam may cause frothing which can be violent, especially if sprayed into containers of hot, burning liquid.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

PRECAUTIONS, PROTECTIVE EQUIPMENT & EMERGENCY PROCEDURES:

Persons not wearing protective equipment should be excluded from the area of the spill until cleanup has been completed.

CONTAINMENT & CLEAN-UP:

Dike area of spill to prevent spreading and pump liquid to salvage tank. Absorb remaining liquid on vermiculite, floor absorbent or other absorbent material and shovel into containers.

SECTION 7 - HANDLING AND STORAGE

HANDLING:

Avoid contact with skin, eyes and clothing. Avoid inhalation of vapors. Wash thoroughly after handling.

STORAGE:

Keep in closed or covered containers when not in use. Store in cool dry place with adequate ventilation. Do not store near strong oxidizing materials.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES:

Not established for product or components

Section 8 continued on next page

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION (continued)

ENGINEERING CONTROLS:

Provide sufficient ventilation to maintain exposure below level of overexposure.

EYE / FACE PROTECTION:

Chemical splash goggles, in compliance with OSHA regulations, are advised.

SKIN PROTECTION:

Wear protective gloves such as Neoprene or Buna-N.

RESPIRATORY PROTECTION:

Not required under normal conditions of use; however, a NIOSH/MSHA supplied air respirator or canister-type respirator equipped with organic vapor cartridge is recommended if there is insufficient ventilation to maintain exposures below established exposure limits.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, colorless or yellow liquid @ 68° F (20° C)
Odor: Mild
pH: Unavailable
Freezing Point: <32° F (0° C)
Initial Boiling Point: ~477° F (247° C)
Flash Point: >253° F (123° C) PMCC
Evaporation Rate: Slower (Ethyl Ether = 1)
Upper Explosion Limit: Unavailable
Lower Explosion Limit: Unavailable
Vapor Pressure: Unavailable
Vapor Density: Heavier
Relative Density: ~1.06 @ 68° F (20° C)
Weight per Gallon: ~8.84
Solubility in Water: ~2%
Volatile %: >95%
VOC %: Unavailable)
Autoignition Temperature: Unavailable
Decomposition Temperature: Unavailable

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:

Reacts violently with strong oxidizers

STABILITY:

Stable under normal conditions of 70° F (21° C) and 14.7 psig (760 mm Hg).

POSSIBILITY OF HAZARDOUS REACTIONS:

Avoid contact with strong oxidizers

CONDITIONS TO AVOID:

None anticipated under normal conditions of use

Section 10 continued on next page

SECTION 10 - STABILITY AND REACTIVITY (continued)

INCOMPATIBILE MATERIALS:
Avoid contact with strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS:
Not anticipated under normal conditions of use.

DECOMPOSITION:
Unknown

SECTION 11 - TOXICOLOGICAL INFORMATION

LIKELY ROUTES OF EXPOSURE:
Skin and eye contact and inhalation

SYMPTOMS:
Eyes: Symptoms include pain and redness.

Skin: Redness

Breathing: Symptoms include irritation of respiratory tract.

Swallowing: Nausea

EFFECTS FROM EXPOSURE:
Immediate: Causes serious irritation to the eyes. May cause skin irritation. Harmful if swallowed.

Delayed: None known

Chronic: None known

TOXICITY DATA:
Acute oral LD_{50} (rat) – >2000 mg/kg (for majority component)
Dermal LD_{50} (rat) – greater than 2000 mg/kg (for majority component)

CARCINOGENICITY
This product is not reported to have any carcinogenic effects. This product (or components) is not listed in IARC Monographs, the current NTP Report on Carcinogens or the current ACGIH TLVs as a carcinogen or potential carcinogen. OSHA does not regulate it as a carcinogen.

SECTION 12 - ECOLOGICAL INFORMATION

ECOTOXICITY:
No data available

PERSISTENCE AND BIODEGRADABILITY
No data available for product

BIOACCUMULATIVE POTENTIAL:
No data available

MOBILITY IN SOIL:
No data available

OTHER ADVERSE EFFECTS:
No data available

SECTION 13 - DISPOSAL CONSIDERATIONS

Incineration is the recommended disposal method for all chemical wastes. Material collected on absorbent material may be deposited in a landfill in accordance with all applicable local, state and federal regulations.

This product, if disposed of, is not considered a hazardous waste under current RCRA definitions.

SECTION 14 - TRANSPORT INFORMATION

Not regulated under current U.S DOT, TDG (Canadian), ICAO (air) or IMO (water) transport regulations.

SECTION 15 - REGULATORY INFORMATION

TSCA INFORMATION:
All components in this product are in compliance with TSCA Inventory requirements.

SARA:
CERCLA/SARA 302: None
CERCLA/SARA 311/312: Acute
CERCLA/SARA 313: None

SECTION 16 - OTHER INFORMATION

PREPARATION DATE: October 15, 2013
SUPERCEDES: Not applicable
REASON FOR REVISION: New SDS

The product information contained herein is believed to be accurate as of the date of the Safety Data Sheet, and is provided without warranty, expressed or implied, as to the results of use of this information or the product to which it relates. Recipient assumes all responsibility for the use of this information and the use (alone or in combination with any other product), storage or disposal of the product, including any resultant personal injury or property damage.

END OF REPORT

Material Safety Data Sheet
The Dow Chemical Company

Ex. 5 - Deliberative

oduct Name: PPH, Basic

Issue Date: 11/15/2011
Print Date: 16 Nov 2011

e Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, there is important information throughout the document. We expect you to follow the precautions entified in this document unless your use conditions would necessitate other appropriate methods or tions.

Product and Company Identification

oduct Name
PPH, Basic

Ex. 5 - Deliberative

OMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

Ex. 5 - Deliberative

2. Hazards Identification

Emergency Overview
Color: Colorless to yellow
Physical State: Liquid.
Odor: Mild
Hazards of product:

Ex. 5 - Deliberative

DANGER! Causes severe eye burns. Causes severe skin burns. Causes burns of the mouth and throat. Causes respiratory tract irritation. Aspiration hazard. Can enter lungs and cause damage. Evacuate area. Keep upwind of spill.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.
Skin Contact: Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: At room temperature, vapors are minimal due to low volatility. Vapor from heated material or mist may be hazardous on single exposure. Mist may cause severe irritation of upper respiratory tract (nose and throat).
Ingestion: Low toxicity if swallowed. Swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract.
Aspiration hazard: Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

3. Composition Information

Component	CAS #	Amount
Dipropylene glycol phenyl ether (D. PPH)	51730-94-0	<= 85.0 %
Propylene glycol phenyl ether (PPH)	770-35-4	<= 30.0 %
Propoxylated Impurities	Not applicable	<= 10.0 %
2-Hydroxy-alpha-methyl-benzeneethanol	33206-31-4	<= 5.0 %
2-Hydroxy-beta-methyl-benzeneethanol	134342-25-9	<= 5.0 %
Polypropylene glycol phenyl ether	28212-40-0	<= 5.0 %
Sodium hydroxide	1310-73-2	>= 0.0 - <= 5.0 %

Ex. 5 - Deliberative

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing. Seek medical attention if symptoms occur or irritation persists. Wash clothing before reuse. Suitable emergency safety shower facility should be immediately available.
Eye Contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.
Ingestion: Do not induce vomiting. Give one cup (8 ounces or 240 ml) of water or milk if available and transport to a medical facility. Do not give anything by mouth unless the person is fully conscious.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

Maintain adequate ventilation and oxygenation of the patient. Eye irrigation may be necessary for an extended period of time to remove as much caustic as possible. Duration of irrigation and treatment is at the discretion of medical personnel. If burn is present, treat as any thermal burn, after decontamination. Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function. Water fog, applied gently may be used as a blanket for fire extinguishment.
Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Evacuate area. Keep upwind of spill. Ventilate area of leak or spill. Only trained and properly protected personnel must be involved in clean-up operations. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Sand. Vermiculite. Collect in suitable and properly labeled containers. Large spills: Contain spilled material if possible. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. Handling and Storage

Handling

General Handling: Do not get in eyes, on skin, on clothing. Do not swallow. Avoid breathing vapor or mist. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.
Other Precautions: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Storage
Store in the following material(s): Carbon steel. Stainless steel. Phenolic lined steel drums. Do not store in: Aluminum. Copper. Galvanized iron. Galvanized steel. See Section 10 for more specific information.

Storage Period:
Bulk
6 Months
Metal drums.
24 Months

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Sodium hydroxide	ACGIH	Ceiling	2 mg/m3
	OSHA Table Z-1	PEL	2 mg/m3

Personal Protection
Eye/Face Protection: Use chemical goggles.
Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.
Ingestion: Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

Engineering Controls
Ventilation: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance

Physical State	Liquid.
Color	Colorless to yellow
Odor	Mild
Odor Threshold	No test data available
pH	No test data available
Melting Point	No test data available
Freezing Point	< 0 °C (< 32 °F) *Literature*
Boiling Point (760 mmHg)	247 °C (477 °F) *Literature*
Flash Point - Closed Cup	123 °C (253 °F) *Setaflash Closed Cup ASTMD3278*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Flammable Limits In Air	**Lower:** No test data available **Upper:** No test data available
Vapor Pressure	0.0155 mmHg @ 25 °C *Literature*
Vapor Density (air = 1)	No test data available
Specific Gravity (H2O = 1)	1.0578 25 °C/25 °C *Literature*
Solubility in water (by weight)	2 % @ 25 °C *Literature*
Partition coefficient, n-octanol/water (log Pow)	No data available for this product. See Section 12 for individual component data.
Autoignition Temperature	No test data available
Decomposition Temperature	No test data available
Dynamic Viscosity	25.7 cps @ 25 °C *Literature*
Kinematic Viscosity	No test data available

10. Stability and Reactivity

Reactivity
No dangerous reaction known under conditions of normal use.

Chemical stability
Thermally stable at typical use temperatures.

Possibility of hazardous reactions
Polymerization will not occur.

Conditions to Avoid: Do not distill to dryness. Product can oxidize at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Ketones. Organic acids.

11. Toxicological Information

Acute Toxicity
Ingestion
As product: Single dose oral LD50 has not been determined.
For the major component(s): LD50, rat > 2,000 mg/kg
Dermal
As product: The dermal LD50 has not been determined.
For the major component(s): LD50, rabbit > 2,000 mg/kg

Inhalation
As product: The LC50 has not been determined.

Eye damage/eye irritation
May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

Skin corrosion/irritation
Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Sensitization
Skin
For the major component(s): Did not cause allergic skin reactions when tested in guinea pigs.
Respiratory
No specific, relevant data available for assessment.

Repeated Dose Toxicity
Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

Chronic Toxicity and Carcinogenicity
No specific, relevant data available for assessment.

Developmental Toxicity
No specific, relevant data available for assessment.

Reproductive Toxicity
No specific, relevant data available for assessment.

Genetic Toxicology
In vitro genetic toxicity studies were negative for component(s) tested. For the component(s) tested: Animal genetic toxicity studies were predominantly negative.

12. Ecological Information

Toxicity

Data for Component: **Dipropylene glycol phenyl ether**
Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, rainbow trout (Oncorhynchus mykiss), static, 96 h: 204 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, water flea Daphnia magna, static test, 48 h, immobilization: 336 mg/l
Aquatic Plant Toxicity
ErC50, Pseudokirchneriella subcapitata (green algae), Growth rate inhibition, 96 h: 188 mg/l

Data for Component: **Propylene glycol phenyl ether**
Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, Pimephales promelas (fathead minnow), static, 96 h: 280 mg/l
Aquatic Invertebrate Acute Toxicity
LC50, water flea Daphnia magna, static test, 48 h, survival: 370 mg/l
Aquatic Plant Toxicity
EC50, Desmodesmus subspicatus (green algae), static test, Growth rate inhibition, 72 h: > 100 mg/l

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**
No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**
No data available.

Data for Component: **Polypropylene glycol phenyl ether**
No data available.

Data for Component: **Sodium hydroxide**

May increase pH of aquatic systems to > pH 10 which may be toxic to aquatic organisms.

Persistence and Degradability

Data for Component: **Dipropylene glycol phenyl ether**

Material is expected to be readily biodegradable.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
100 %	28 d	OECD 301F Test	pass

Data for Component: **Propylene glycol phenyl ether**

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
Biodegradation rate may increase in soil and/or water with acclimation.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
72 %	28 d	OECD 301F Test	fail

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
3.72E-11 cm3/s	3.5 h	Estimated.

Theoretical Oxygen Demand: 2.31 mg/mg

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**

No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**

No data available.

Data for Component: **Polypropylene glycol phenyl ether**

No data available.

Data for Component: **Sodium hydroxide**

Biodegradation is not applicable.

Bioaccumulative potential

Data for Component: **Dipropylene glycol phenyl ether**

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.73 Estimated.
Bioconcentration Factor (BCF): < 1; Estimated.

Data for Component: **Propylene glycol phenyl ether**

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): 1.41 Measured

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**

Bioaccumulation: No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**

Bioaccumulation: No data available.

Data for Component: **Polypropylene glycol phenyl ether**

Bioaccumulation: No data available.

Data for Component: **Sodium hydroxide**

Bioaccumulation: No bioconcentration is expected because of the relatively high water solubility.

Mobility in soil

Data for Component: **Dipropylene glycol phenyl ether**
Mobility in soil: Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process., Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 12.36 Estimated.
Henry's Law Constant (H): 4.77E-10 atm*m3/mole

Data for Component: **Propylene glycol phenyl ether**
Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 19 - 21 Estimated.
Henry's Law Constant (H): 4.41E-07 atm*m3/mole; 25 °C Estimated.

Data for Component: **2-Hydroxy-alpha-methyl-benzeneethanol**
Mobility in soil: No data available.

Data for Component: **2-Hydroxy-beta-methyl-benzeneethanol**
Mobility in soil: No data available.

Data for Component: **Polypropylene glycol phenyl ether**
Mobility in soil: No data available.

Data for Component: **Sodium hydroxide**
Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 14 Estimated.

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE
Hazard Class: 8 **ID Number:** UN 3267 **Packing Group:** PG II

DOT Bulk
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE
Hazard Class: 8 **ID Number:** UN 3267 **Packing Group:** PG II

IMDG
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE
Hazard Class: 8 **ID Number:** UN3267 **Packing Group:** PG II
EMS Number: F-A,S-B
Marine pollutant.: No

ICAO/IATA
Proper Shipping Name: CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name: CONTAINS SODIUM HYDROXIDE

Hazard Class: 8 **ID Number:** UN3267 **Packing Group:** PG II
Cargo Packing Instruction: 855
Passenger Packing Instruction: 851
Additional Information

Reportable quantity: 20,000 lb – SODIUM HYDROXIDE

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Ex. 5 - Deliberative

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Sodium hydroxide	1310-73-2	>= 0.0 - <= 5.0 %

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Product Literature
Additional information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure. Additional information on this and other products may be obtained by visiting our web page.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	3	1	0

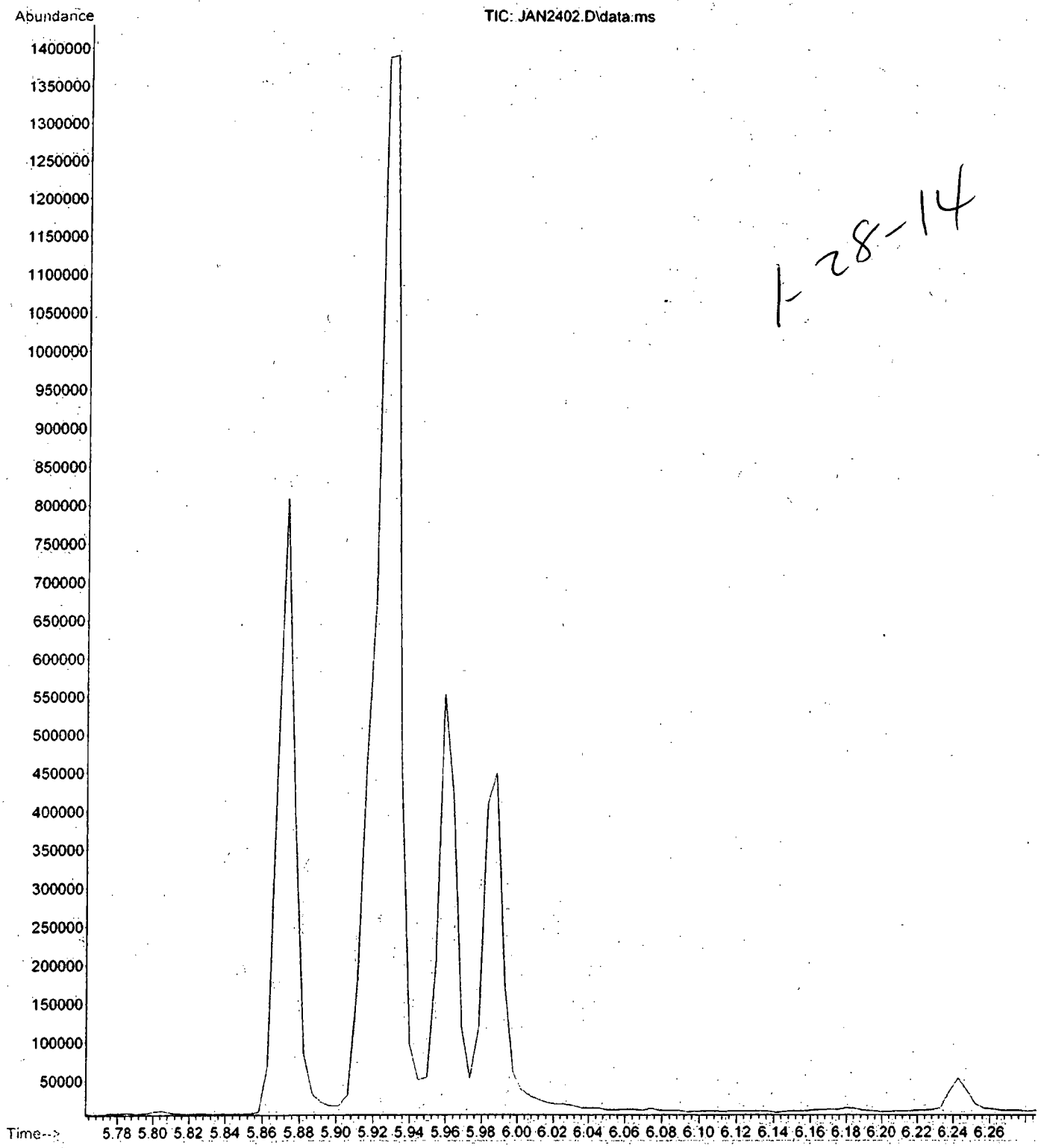
Recommended Uses and Restrictions
Identified uses
Industrial solvent. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

Revision
Identification Number: 1010291 / 0000 / Issue Date 11/15/2011 / Version: 7.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.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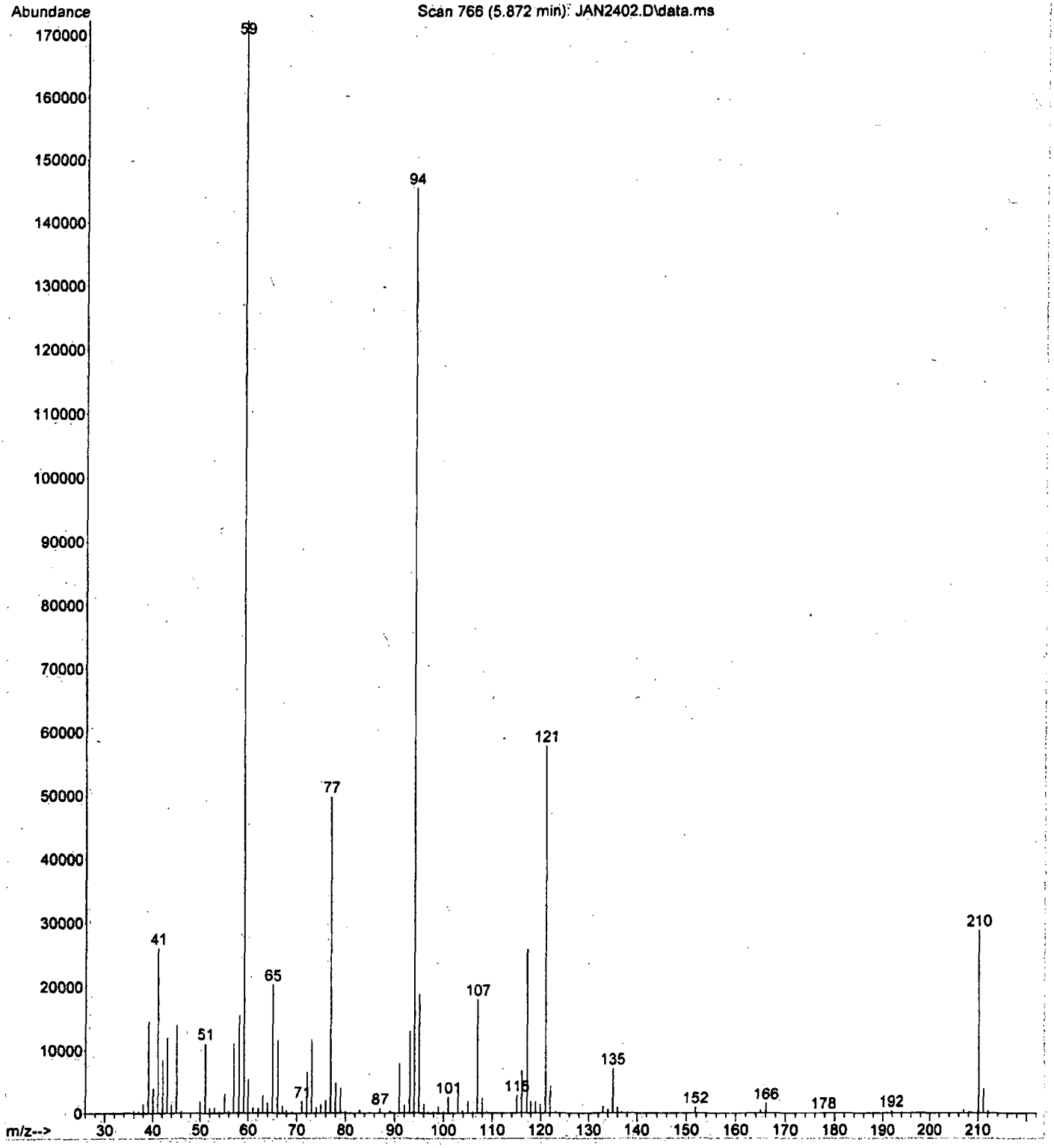
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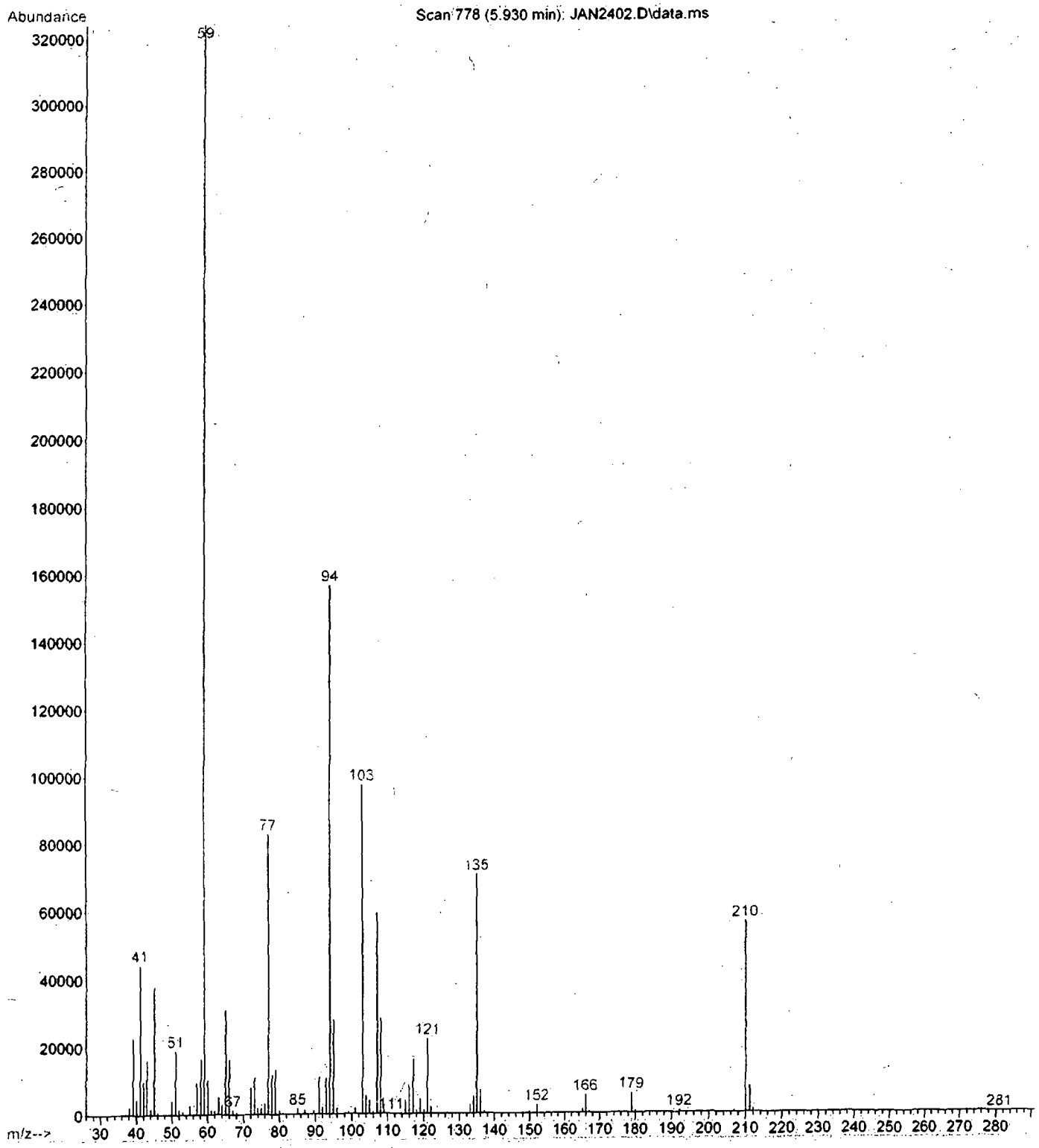
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135
210
41
51
121
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85
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152
166
179
192
281
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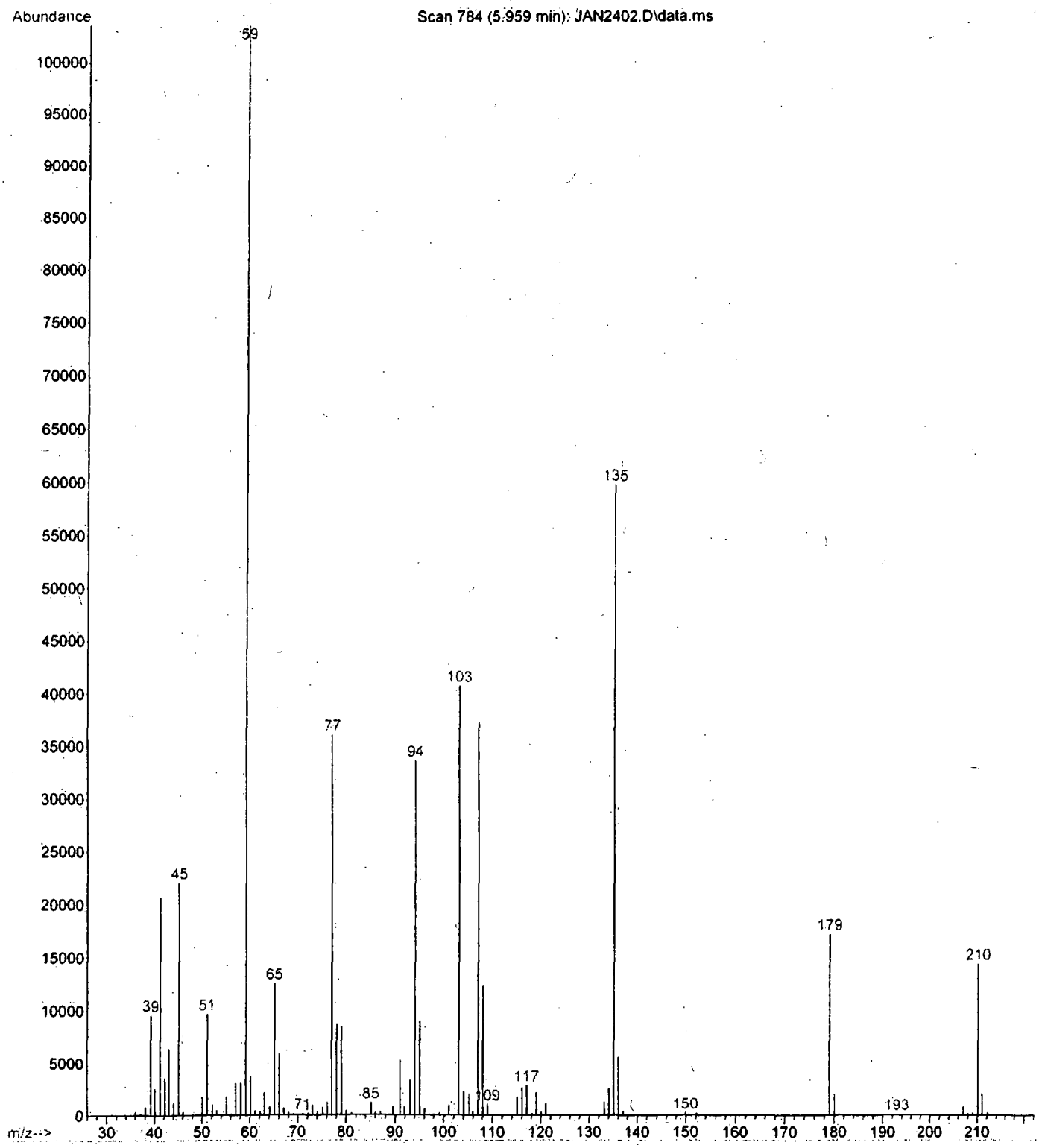

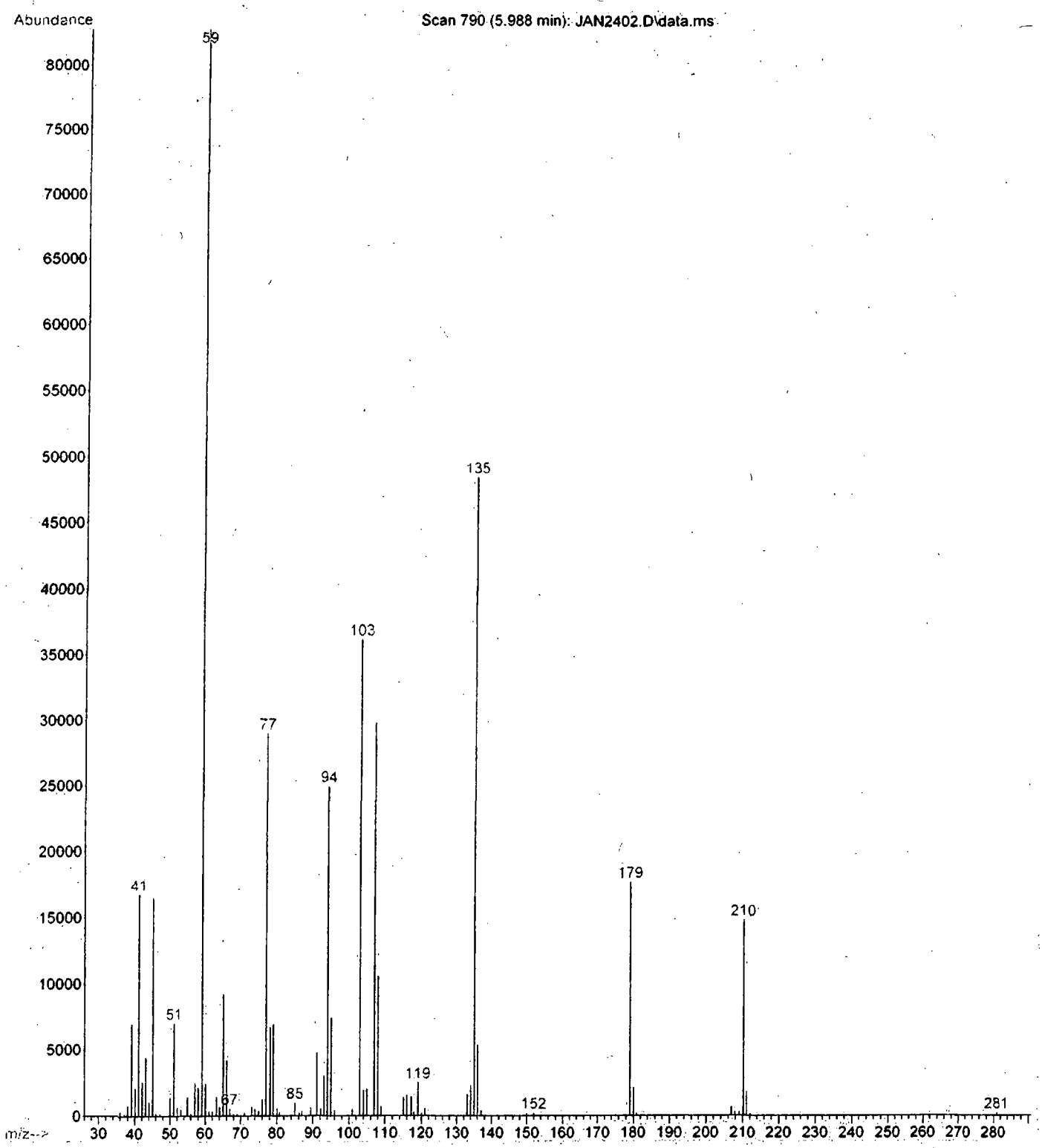
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59
135
103
77
94
41
179
210
51
119
67
85
152
281

Warner, Sue

From: Caporale, Cynthia
Sent: Monday, January 27, 2014 5:11 PM
To: Warner, Sue; Slayton, Joe; Graybill, Eric; Gundersen, Jennifer; Molnar, Adam; Poff, Kevin; Zawodny, Peggy
Cc: Wilding, Stevie; Curry, John; Nguyen, Hoang; Greco, Sue
Subject: RE: Sample from West Virginia Chemical Leak- Semi-volatile TIC results

Thank you for pulling this together. Some questions:

Is this ready enough for me to distribute as preliminary of what is in the sample? Ex. 5 - Deliberative

Would it be possible to identify which compounds are part of the crude MCHM and crude PPH since the folks I'm sending this to will want to know that. (some do have PPH but maybe a separate column that references which MSDS it was from???)

Ex. 5 - Deliberative

Of the unknown peaks are there any that seem high or of concern from our perspective? Earlier today you and Eric mentioned that most of these might be other alcohols, do the masses indicate that? Ex. 5 - Deliberative

Ex. 5 - Deliberative

Were there any SVOC routine analyte list compounds detected (other than surrogates/IS)?

Ex. 5 - Deliberative

Cindy

From: Warner, Sue
Sent: Monday, January 27, 2014 2:39 PM
To: Caporale, Cynthia; Slayton, Joe; Graybill, Eric; Gundersen, Jennifer; Molnar, Adam; Poff, Kevin; Zawodny, Peggy
Cc: Wilding, Stevie; Curry, John; Nguyen, Hoang; Greco, Sue
Subject: Sample from West Virginia Chemical Leak- Semi-volatile TIC results

Attached is the list of TICs from Eric's SVOA analysis.

Ex. 5 - Deliberative

Systematics of methanol oxidation: Methylotrophs, organisms that can grow using only one-carbon compounds such as methanol, are known to use both methane and methanol as their sole carbon and energy source under both aerobic and microaerobic (low oxygen) conditions (Brock and Madigan, 1991). Methylotrophs are of commercial interest in the bacterial metabolism of C_1 compounds (Heijthuijsen and Hansen, 1990; Komagata, 1990). Consequently, a large number of methanol-utilizing bacteria have been isolated from a wide variety of natural sources, and most of these isolates have been identified as aerobic, Gram-negative bacteria (Komagata, 1990).

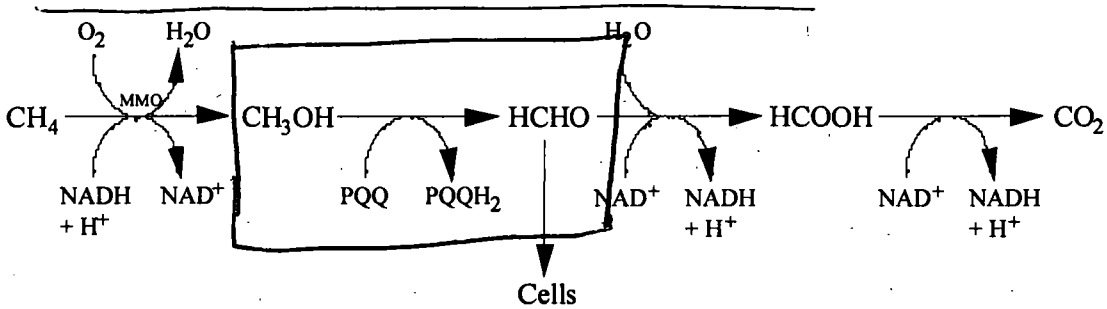


Figure 3-1. Methane oxidation pathway of methanotrophic microorganisms. Adapted from (Chang, 1995).

Ex. 5 - Deliberative

Methanol is also an intermediate of the methane oxidation pathway used by methanotrophic organisms (see Figure 3-1); methanotrophs are ubiquitous in nature. Methanotrophs oxidize methane to methanol by the enzyme methane monooxygenase.

Ex. 5 - Deliberative

Methanol is then oxidized to formaldehyde by methanol dehydrogenase (Lehninger et al., 1993; Smeraldi et al., 1994) which is then assimilated into cell material by the activity of either of two pathways, one involving the formation of the amino acid serine and the other

Table 3-1
Selected types of aerobic and anaerobic respiration involved in microbial metabolism of organic matter

Process	Electron Acceptor	Metabolic Products	Relative Potential Energy
Aerobic Respiration	O_2	CO_2, H_2O	High
Denitrification	NO^{3-}	CO_2, N_2	
Iron reduction	Fe^{3+}	CO_2, Fe^{2+}	
Sulfate reduction	SO_4^{2-}	CO_2, H_2S	
Methanogenesis	CO_2	CO_2, CH_4	Low

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Compound	CAS number	MSDS
Cyclohexanemethanol	100-49-2	Eastman
Cyclohexanemethanol, 4-methyl-, trans-	3937-49-3	Eastman
Cyclohexanemethanol, 4-methyl-, cis-	????	Eastman
Cyclohexanecarboxylic acid, 4-methyl-, methyl ester	51181-40-9	Eastman
1-phenoxypropan-2-ol (PPH) (propylene glycol phenyl ether)	770-35-4	Dow
Possible 1,4-cyclohexanedimethanol	105-08-8	Eastman
A compound similar to Ethanol, 2-(4-methylphenoxy)-	NA	Dow?
1,4-Cyclohexanedicarboxylic acid, dimethyl ester (Dimethyl 1,4-cyclohexane dicarboxylate)	94-60-0	Eastman
Dipropylene glycol phenyl ether (4 peaks)	51730-94-0	Dow
Unknown, masses 108, 107 and 166	NA	
Unknown, masses 121, 59, 91and 134	NA	
Unknown alcohol, masses 59, 135 and 107	NA	
Unknown alcohol, masses 59, 135 and 94	NA	
Unknown alcohol, masses 59, 135 and 107	NA	
Unknown alcohol, masses 59, 135 and 107	NA	
Unknown, masses 59, 135, 107 and 161	NA	

- Eastman = Eastman MSDS for Crude MCHM 10-19-05
- Dow = DOW MSDS for PPH, Basic, 11-15-11

From: Weber, Eric
Sent: Monday, February 03, 2014 10:02 AM
To: Gray, Wendy; Allgeier, Steve; Magnuson, Matthew; Hedrick, Elizabeth; Arguto, William
Subject: RE: MCHM & PPH Product TICs

Wendy,

I should be able to get the list of chemicals thought to be in the tank out perhaps this afternoon, more likely tomorrow morning.

Eric

From: Gray, Wendy
Sent: Monday, February 03, 2014 9:39 AM
To: Weber, Eric; Allgeier, Steve; Magnuson, Matthew; Hedrick, Elizabeth; Arguto, William
Subject: MCHM & PPH Product TICs

Good morning,
Just wanted to check in primarily with Matt and Eric, to see how we are coming along with possible tentatively identified compounds associated with the contaminants related to the incident?

Thanks for your help!

Wendy Gray, P.E.
Environmental Engineer
US EPA Region III
Drinking Water Branch
1650 Arch Street (3WP21)
Philadelphia, PA 19103
Office: (215) 814-5673
Cell: (267) 216-6521
Fax: (215) 814-2302
Gray.Wendy@EPA.gov

LSC Area Percent Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

6.19 to 10mL

Integration Parameters: rteint.p
Integrator: RTE
Smoothing : OFF Filtering: 5
Sampling : 1 Min Area: 1 % of largest Peak
Start Thrs: 0.2 Max Peaks: 100
Stop Thrs : 0 Peak Location: TOP

If leading or trailing edge < 100 prefer < Baseline drop else tangent >
Peak separation: 5

Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Title : Calibration

Signal : TIC: wastetol0mL.D\data.ms

peak #	R.T. min	first scan	max scan	last scan	PK TY	peak height	corr. area	corr. % max.	% of total
1	2.449	25	30	50	rBV	1751056	2183032	1.24%	0.282%
2	4.080	322	332	335	rBV2	7129419	16553141	9.39%	2.135%
3	4.145	340	344	365	rVB2	10814517	28282910	16.04%	3.647%
4	4.410	388	393	397	rBV	2452985	3432702	1.95%	0.443%
5	4.545	397	418	421	rBV2	25024556	146281196	82.95%	18.863%
6	4.799	442	465	468	rVB	29370675	176352843	100.00%	22.741%
7	4.880	473	480	484	rVV	10259200	14282117	8.10%	1.842%
8	4.923	484	488	506	rVB	7543773	9127775	5.18%	1.177%
9	5.377	564	572	579	rBV	10954337	13834703	7.84%	1.784%
10	5.598	609	613	621	rVB	1551657	1830061	1.04%	0.236%
11	5.706	629	633	647	rVB	4395408	6012533	3.41%	0.775%
12	6.047	679	696	701	rBV	22165845	70177799	39.79%	9.050%
13	6.111	701	708	711	rVB	16650742	24762588	14.04%	3.193%
14	6.711	807	819	835	rVB	2747584	4923330	2.79%	0.635%
15	6.884	845	851	870	rVB2	4789742	6460125	3.66%	0.833%
16	7.192	901	908	912	rVB	12121524	13463799	7.63%	1.736%
17	7.424	939	951	957	rBV	18281675	45037665	25.54%	5.808%
18	7.538	957	972	975	rVV2	22003955	74325264	42.15%	9.584%
19	7.586	975	981	983	rVV	18057050	26625214	15.10%	3.433%
20	7.619	983	987	991	rVB	17921963	23286313	13.20%	3.003%
21	8.018	1056	1061	1070	rBV	3964187	4846014	2.75%	0.625%
22	8.094	1070	1075	1081	rVV2	1995606	3334808	1.89%	0.430%
23	8.742	1189	1195	1199	rBV	12383911	14588543	8.27%	1.881%
24	8.807	1201	1207	1212	rVV	3746943	4714879	2.67%	0.608%
25	8.866	1212	1218	1220	rVV2	3819402	5516592	3.13%	0.711%
26	8.888	1220	1222	1227	rVV	3319021	4993634	2.83%	0.644%
27	8.937	1227	1231	1241	rVV	3533490	6503067	3.69%	0.839%
28	9.018	1241	1246	1266	rVB2	1161668	2491297	1.41%	0.321%
29	11.584	1713	1721	1744	rBV	9047166	12476492	7.07%	1.609%
30	13.193	2011	2019	2037	rBV	5610548	8785636	4.98%	1.133%

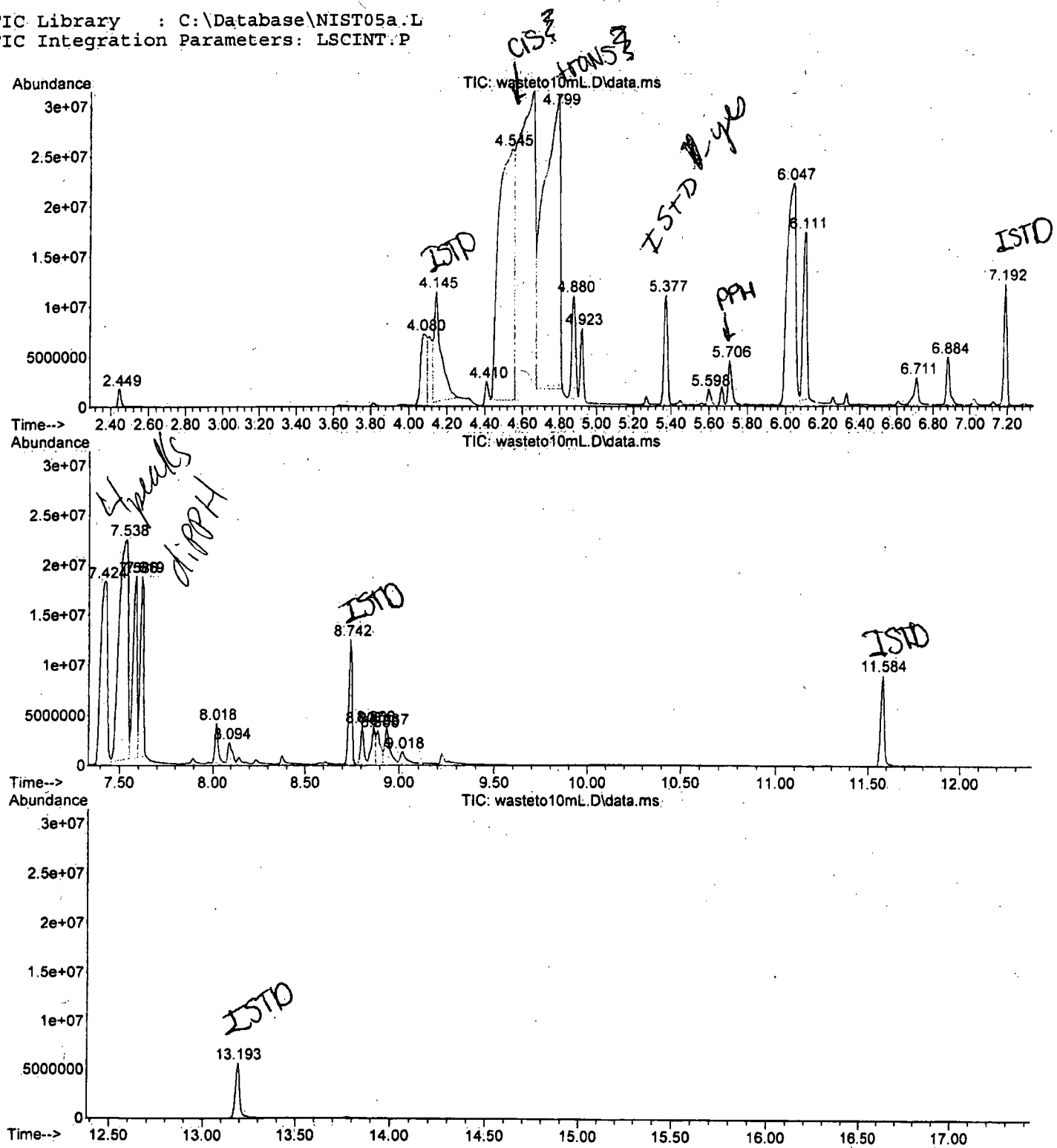
Sum of corrected areas: 775486072

LSC Report - Integrated Chromatogram

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P



Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

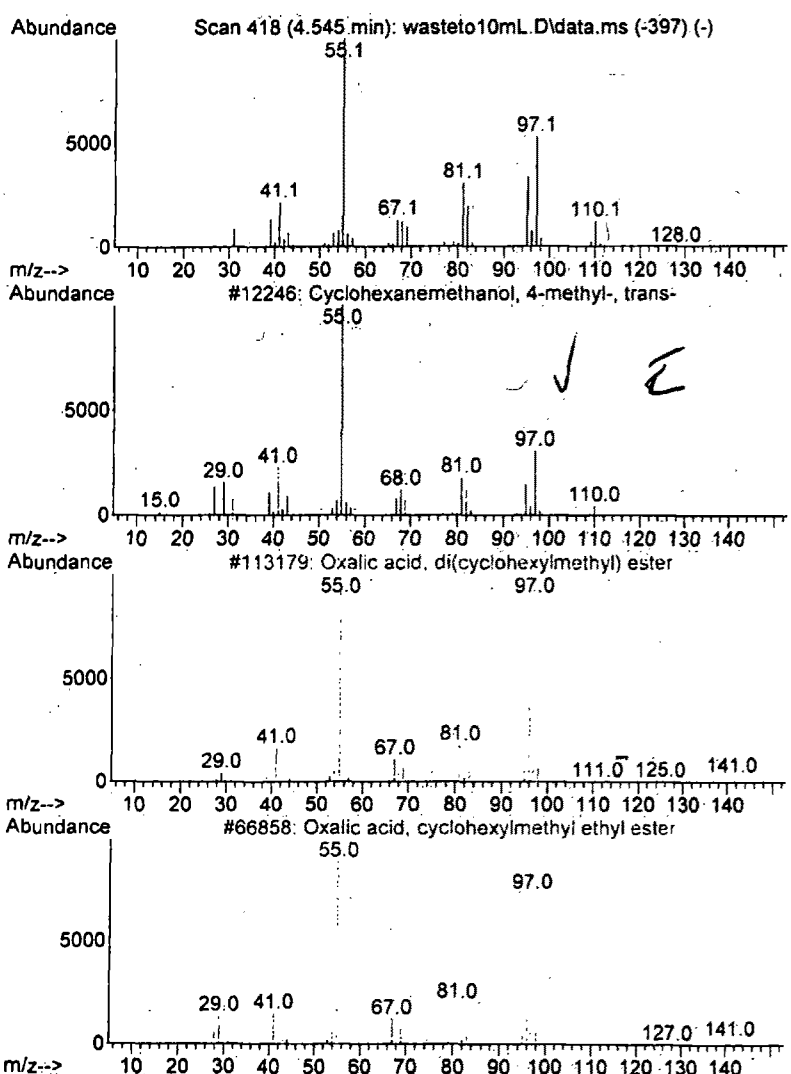
Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

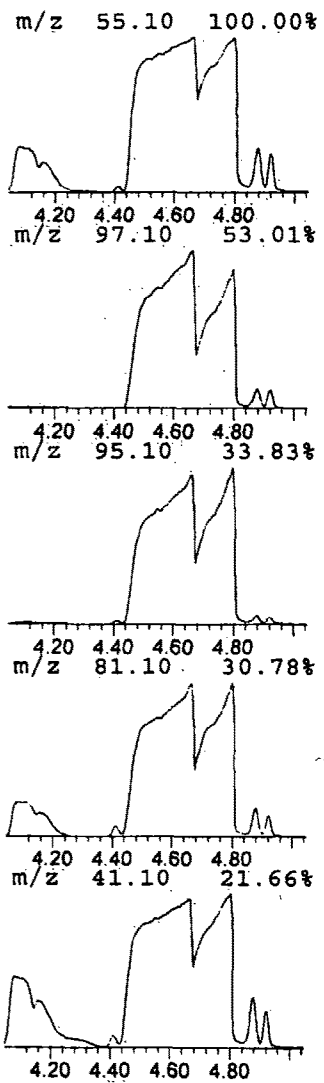
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****
Peak Number 2 Cyclohexanemethanol, 4-meth... Concentration Rank 2

R.T.	EstConc	Area	Relative to ISTD	R.T.
4.545	103.44 ug/mL	146281000	1,4-Dichlorobenzene-d4	4.145

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Cyclohexanemethanol, 4-methyl-, ...	128	C8H16O	003937-49-3	83
2	Oxalic acid, di(cyclohexylmethyl...	282	C16H26O4	1000309-68-5	50
3	Oxalic acid, cyclohexylmethyl et...	214	C11H18O4	1000309-68-0	50
4	Cyclohexanemethanol, 2-methyl-	128	C8H16O	002105-40-0	50
5	Cyclohexanemethanol, 4-methyl-, ...	128	C8H16O	003937-48-2	50





MCHM

MCHM012214.M Sun Jan 26 09:10:31 2014

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

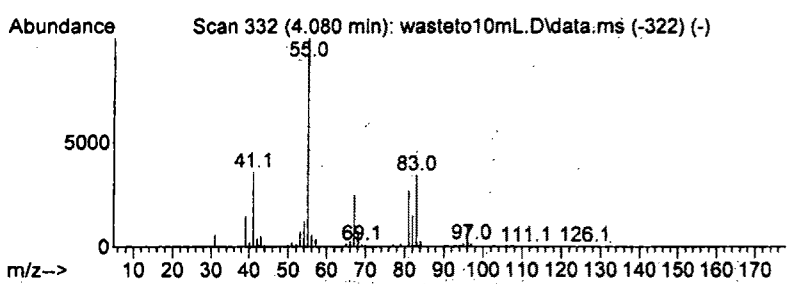
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

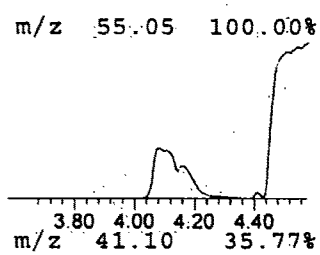
****

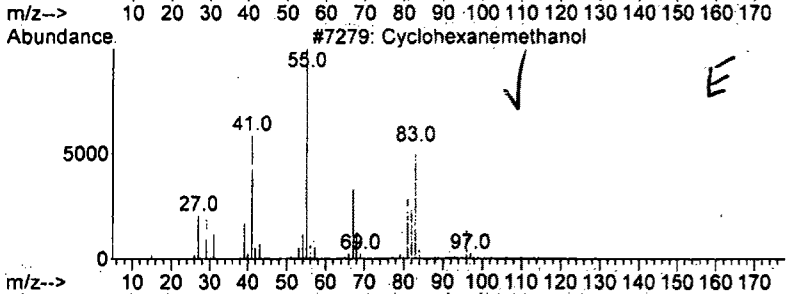
Peak Number 1 Cyclohexanemethanol Concentration Rank 10

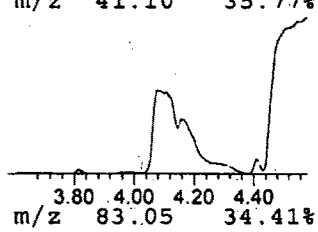
R.T.	EstConc	Area	Relative to ISTD	R.T.
4.080	11.71 ug/mL	16553100	1,4-Dichlorobenzene-d4	4.145

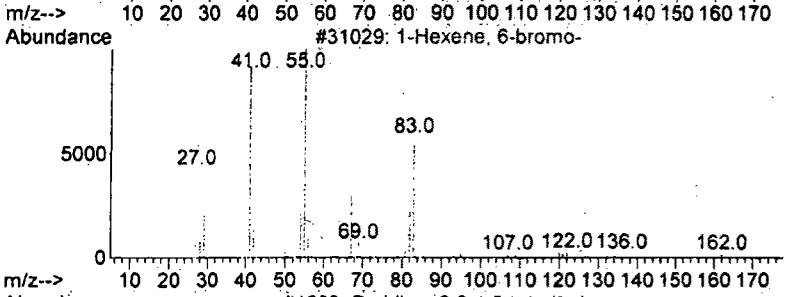
Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Cyclohexanemethanol	114	C7H14O	000100-49-2	90
2	1-Hexene, 6-bromo-	162	C6H11Br	002695-47-8	47
3	Pyridine, 2,3,4,5-tetrahydro-	83	C5H9N	000505-18-0	46
4	Cyclopentane, 1-methyl-2-(2-prop...	124	C9H16	050746-53-7	37
5	1,5-Heptadiene, (Z)-	96	C7H12	007736-34-7	35

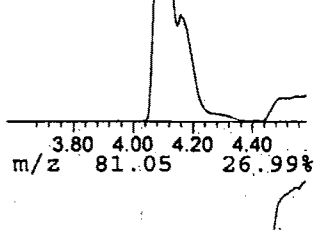


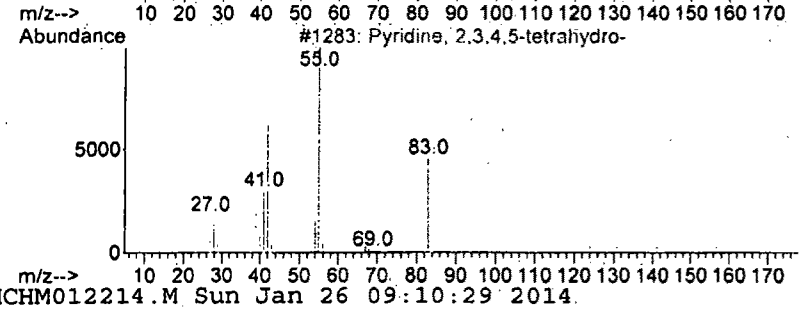


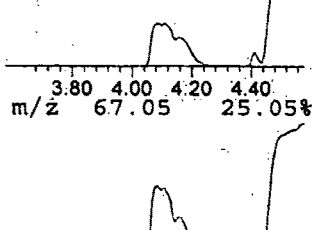












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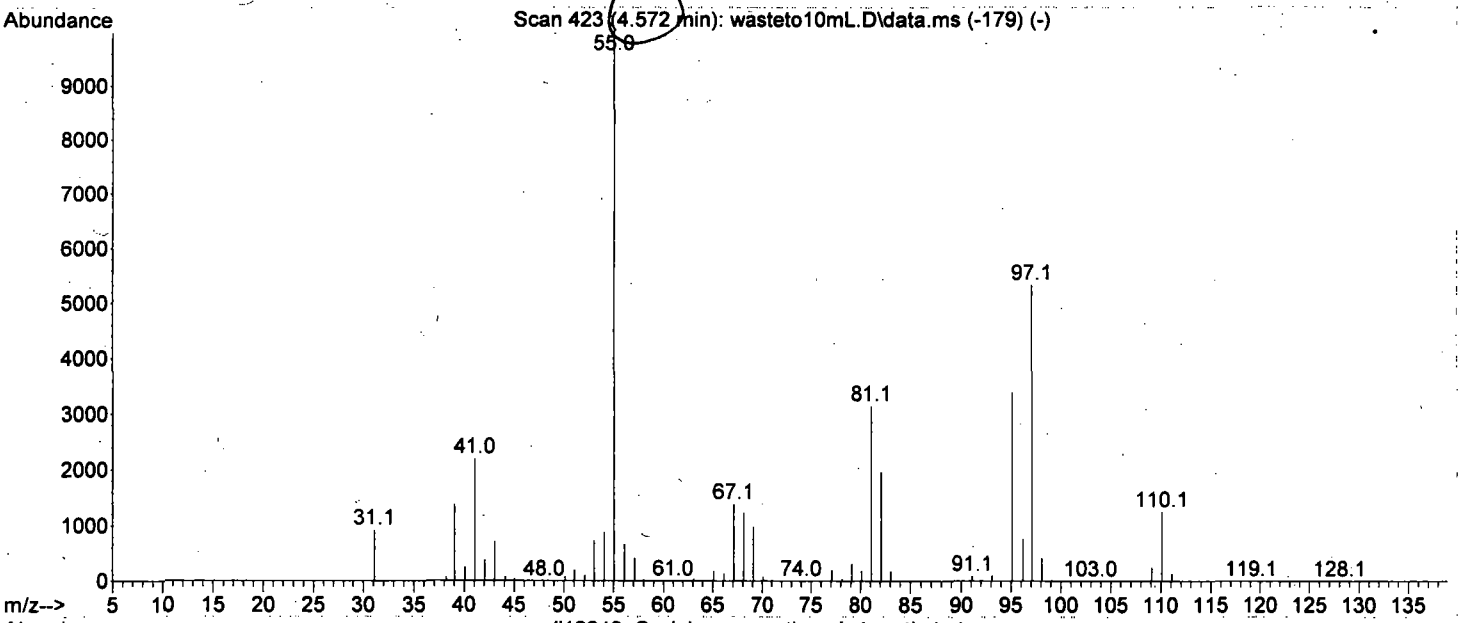
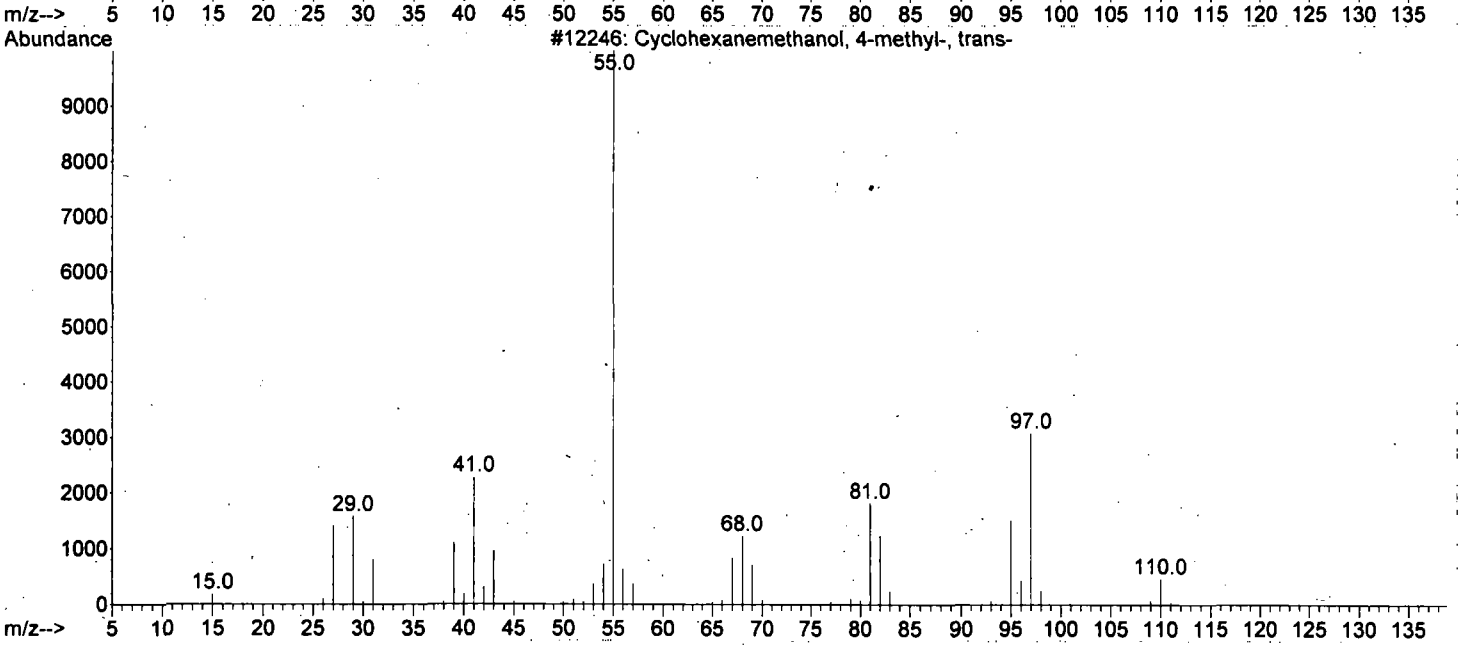
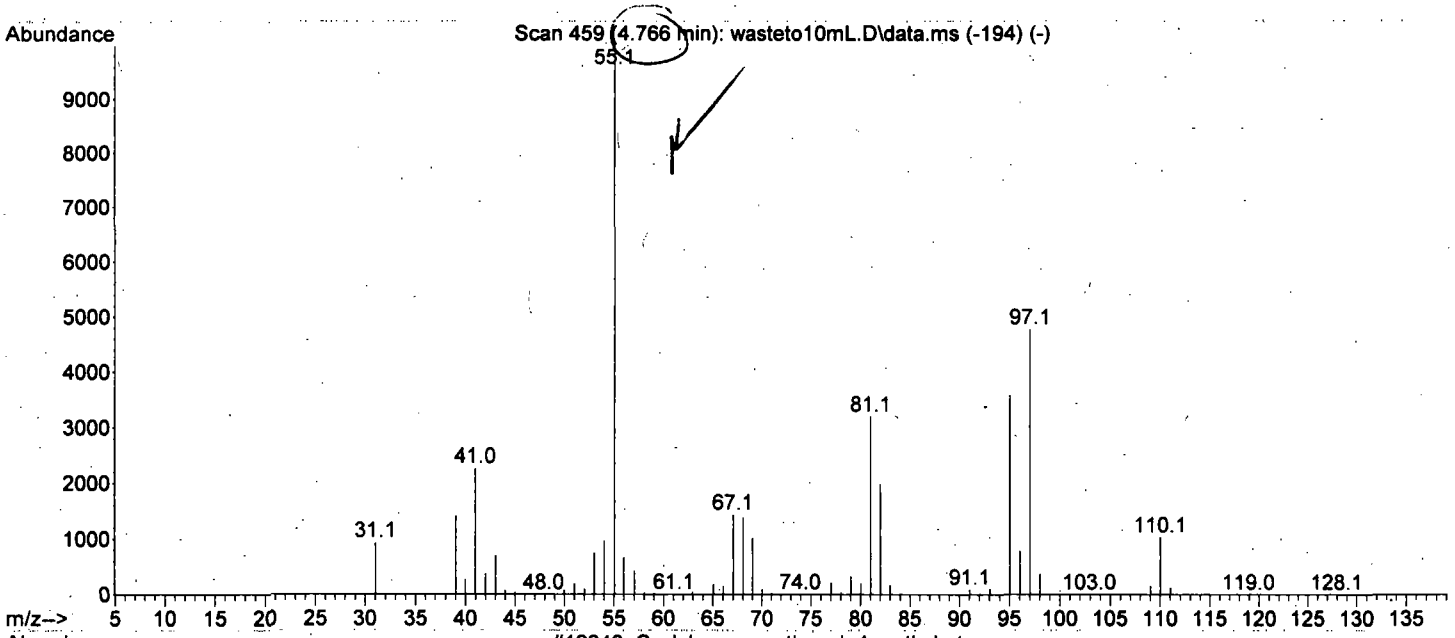
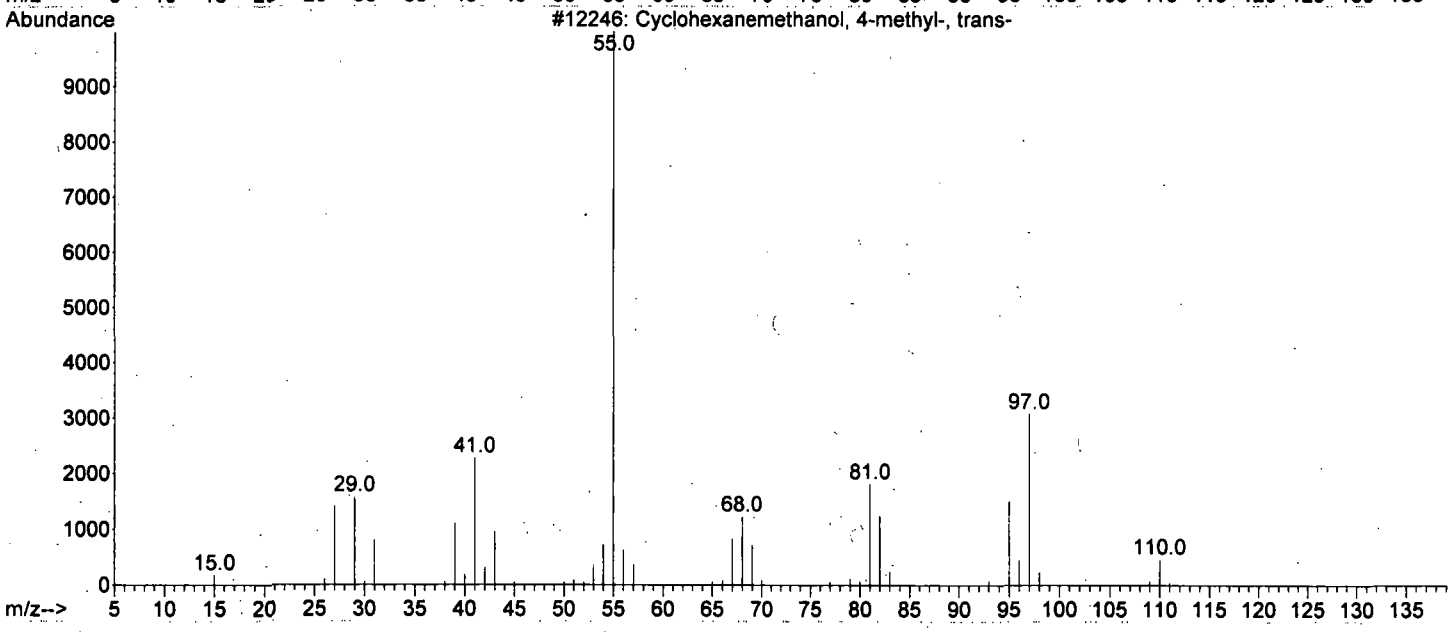
Quality : 83
ID : Cyclohexanemethanol, 4-methyl-, trans-





Library Searched : C:\Database\NIST05a.L
Quality : 83
ID : Cyclohexanemethanol, 4-methyl-, trans-





Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

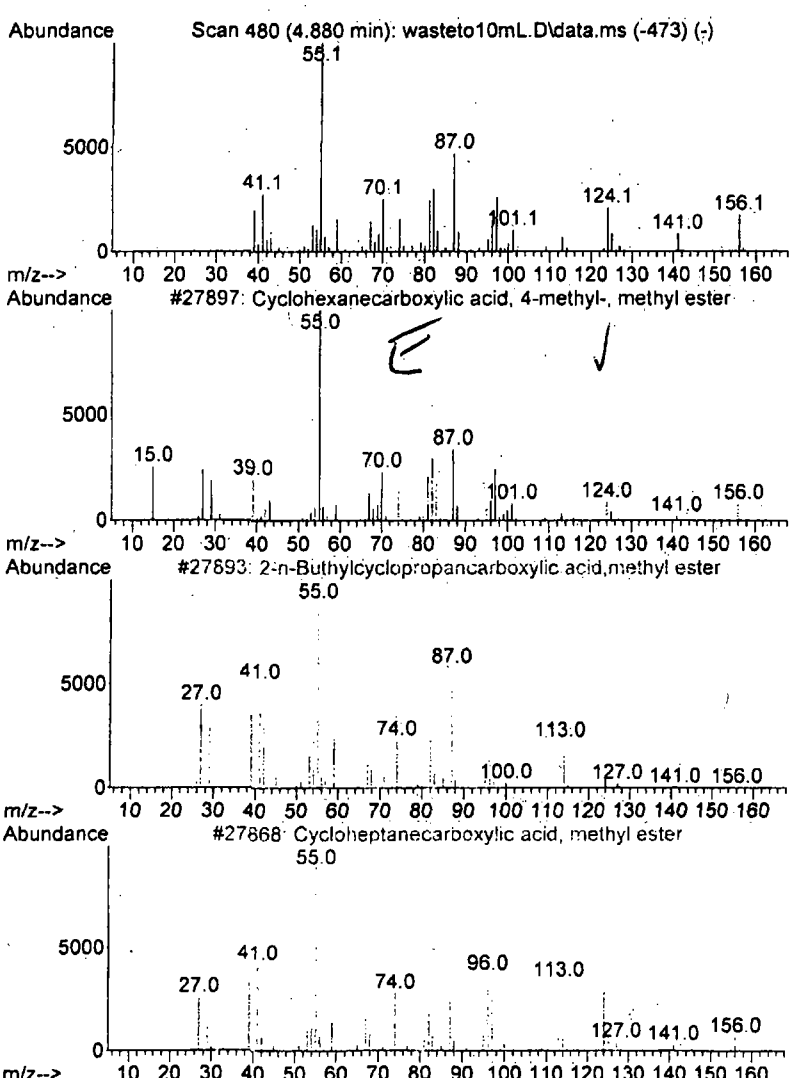
Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

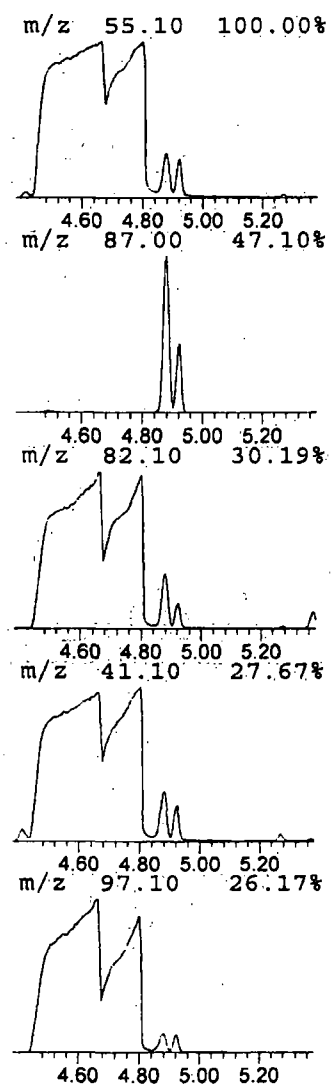
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****
Peak Number 3 Cyclohexanecarboxylic acid,... Concentration Rank 8

R.T.	EstConc	Area	Relative to ISTD	R.T.
4.880	20.65 ug/mL	14282100	Naphthalene-d8	5.377

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Cyclohexanecarboxylic acid, 4-me...	156	C9H16O2	051181-40-9	50
2	2-n-Buthylcyclopropancarboxylic ...,	156	C9H16O2	1000222-16-5	25
3	Cycloheptanecarboxylic acid, met...	156	C9H16O2	060433-00-3	25
4	2-Octenoic acid, methyl ester, (E)-	156	C9H16O2	007367-81-9	16
5	2-Hexenoic acid, methyl ester, (E)-	128	C7H12O2	013894-63-8	10





MCHM012214.M Sun Jan 26 09:10:34 2014

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

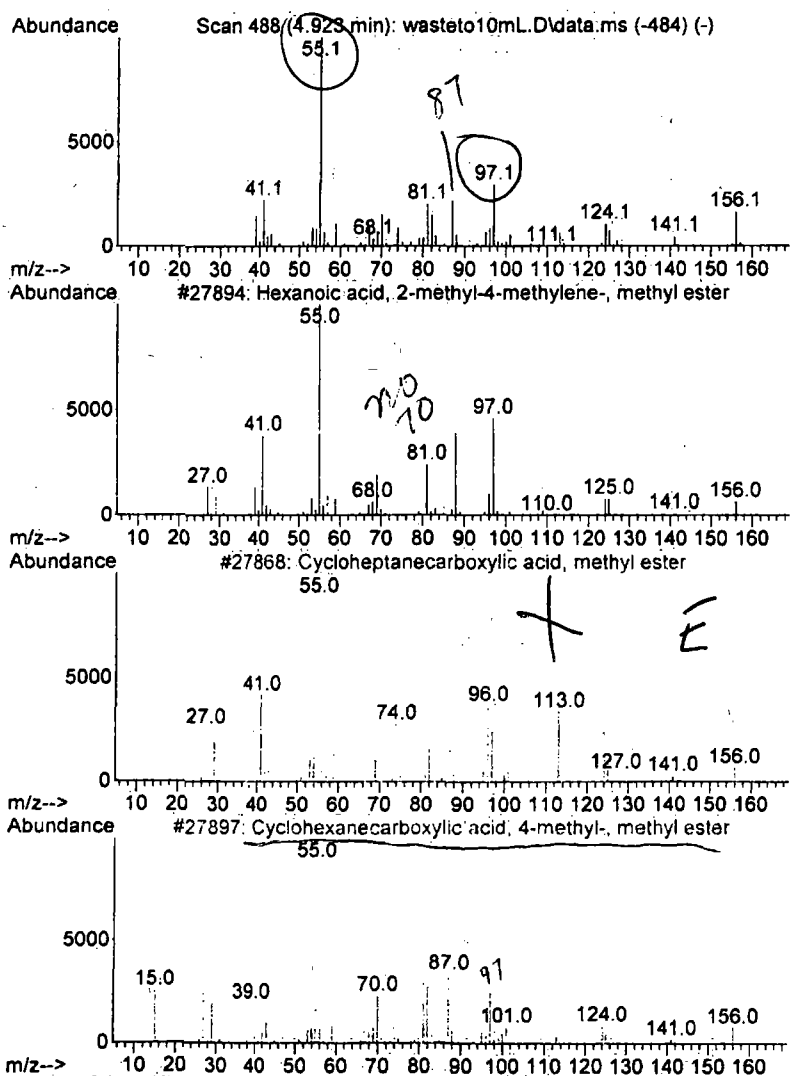
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

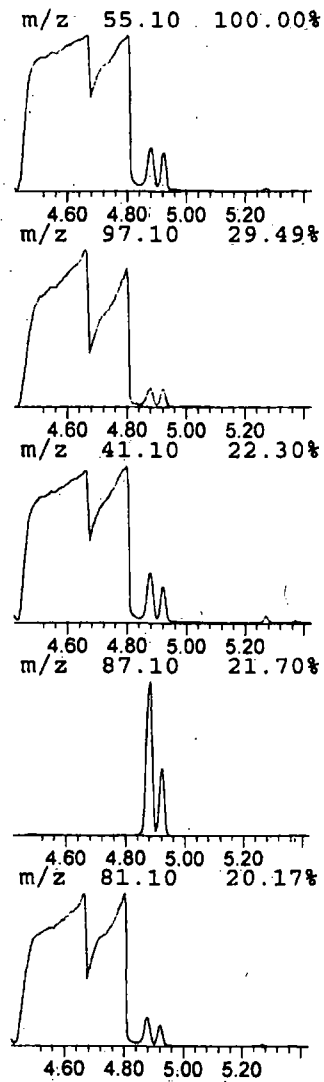
****

Peak Number 4 Hexanoic acid, 2-methyl-4-m... Concentration Rank 9

R.T.	EstConc	Area	Relative to ISTD	R.T.
4.923	13.20 ug/mL	9127780	Naphthalene-d8	5.377

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Hexanoic acid, 2-methyl-4-methyl...	156	C9H16O2	1000152-05-4	53
2	Cycloheptanecarboxylic acid, met...	156	C9H16O2	060433-00-3	40
3	Cyclohexanecarboxylic acid, 4-me...	156	C9H16O2	051181-40-9	38
4	Cyclohexanemethanol, 4-methyl-, ...	128	C8H16O	003937-49-3	22
5	2-Octenoic acid, methyl ester, (E)-	156	C9H16O2	007367-81-9	17





MCHM012214.M Sun Jan 26 09:10:36 2014

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

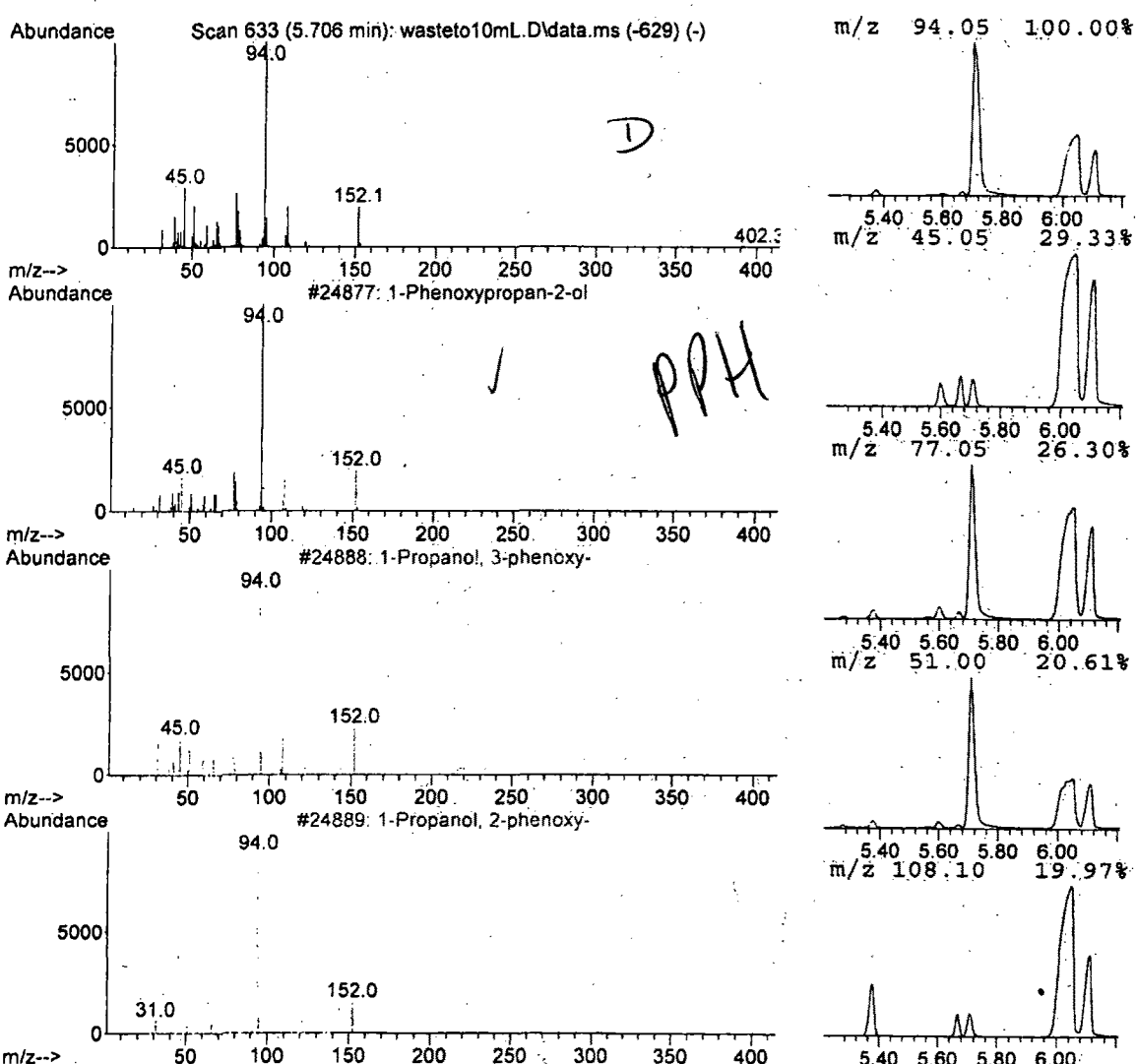
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****

Peak Number 5 1-Phenoxypropan-2-ol Concentration Rank 13

R.T.	EstConc	Area	Relative to ISTD	R.T.
5.706	8.69 ug/mL	6012530	Naphthalene-d8	5.377

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	1-Phenoxypropan-2-ol	152	C9H12O2	000770-35-4	94
2	1-Propanol, 3-phenoxy-	152	C9H12O2	006180-61-6	91
3	1-Propanol, 2-phenoxy-	152	C9H12O2	004169-04-4	49
4	Benzene, (2-methylpropoxy)-	150	C10H14O	001126-75-6	47
5	Ethanol, 2-phenoxy-	138	C8H10O2	000122-99-6	40



MCHM012214.M Sun Jan 26 09:10:38 2014

Library Search Compound Report

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Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

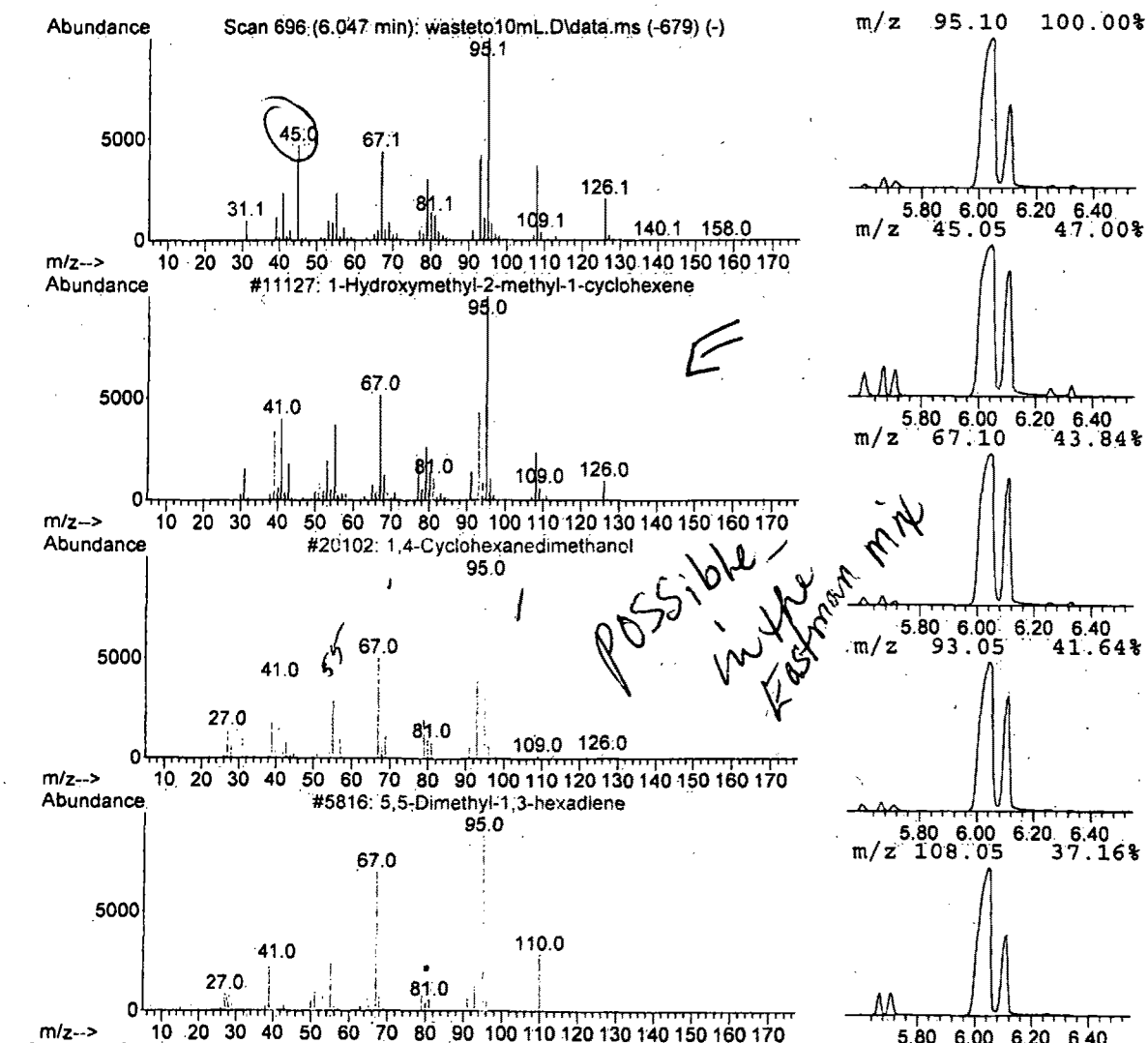
****

Peak Number 6 1-Hydroxymethyl-2-methyl-1-... Concentration Rank 3

R.T.	EstConc	Area	Relative to ISTD	R.T.
6.047	101.45 ug/mL	70177800	Naphthalene-d8	5.377

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	1-Hydroxymethyl-2-methyl-1-cyclo...	126	C8H14O	029474-11-1	83
2	1,4-Cyclohexanedimethanol	144	C8H16O2	000105-08-8	50
3	5,5-Dimethyl-1,3-hexadiene	110	C8H14	001515-79-3	38
4	Bicyclo[2.2.1]heptane-2-methanol	126	C8H14O	005240-72-2	37
5	1,4-Pentadiene, 2,3,4-trimethyl-	110	C8H14	072014-90-5	35

not a great match



POSSible - in the Eastman mix

MCHM012214.M Sun Jan 26 09:10:41 2014

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastet010mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastet010mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

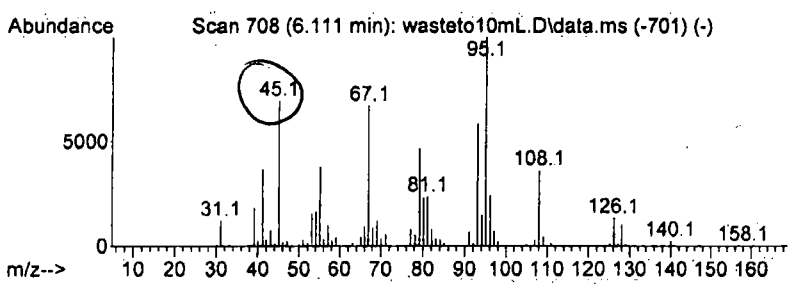
****

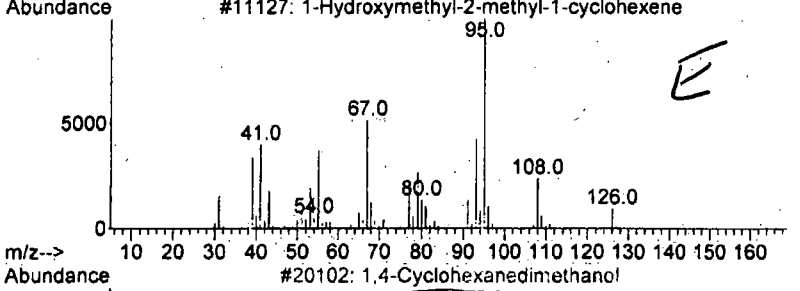
Peak Number 7 1-Hydroxymethyl-2-methyl-1-... Concentration Rank 6

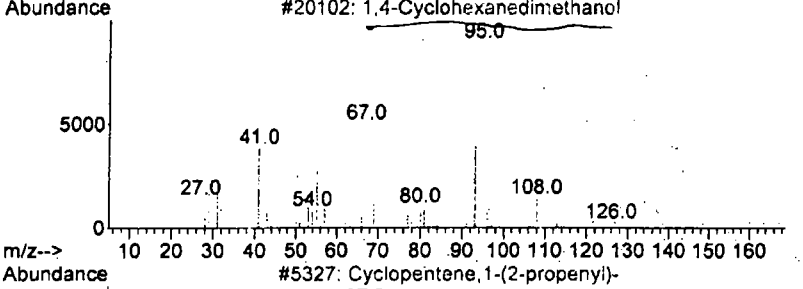
R.T.	EstConc	Area	Relative to ISTD	R.T.
6.111	35.80 ug/mL	24762600	Naphthalene-d8	5.377

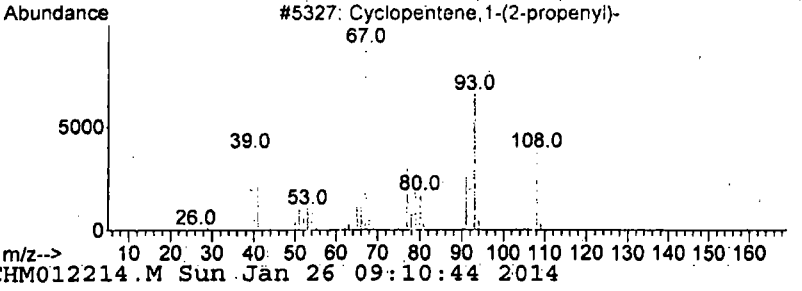
Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	1-Hydroxymethyl-2-methyl-1-cyclo...	126	C8H14O	029474-11-1	46
2	1,4-Cyclohexanedimethanol	144	C8H16O2	000105-08-8	43
3	Cyclopentene,1-(2-propenyl)-	108	C8H12	037689-19-3	38
4	1,4-Pentadiene, 2,3,3-trimethyl-	110	C8H14	000756-02-5	35
5	Cyclopentane, (3-methylbutylidene)-	138	C10H18	053366-51-1	35

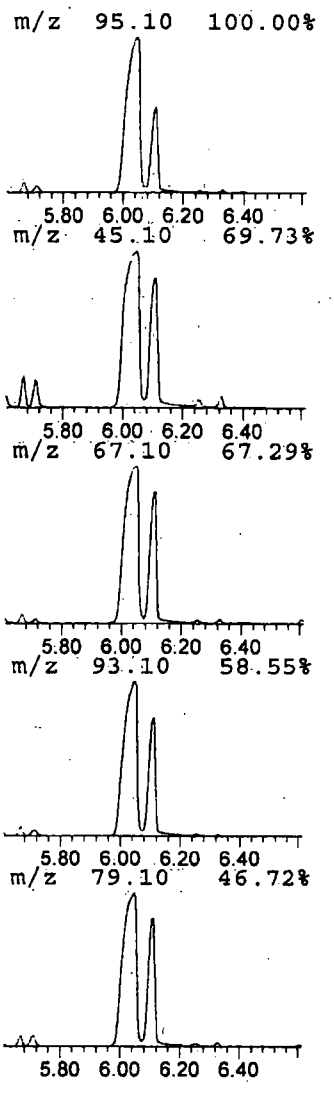
not a great match











Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastet010mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastet010mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

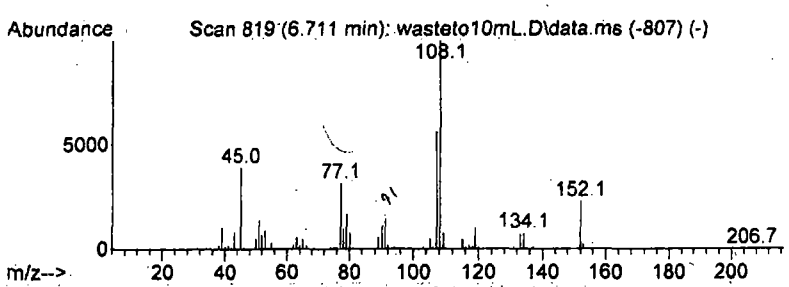
Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

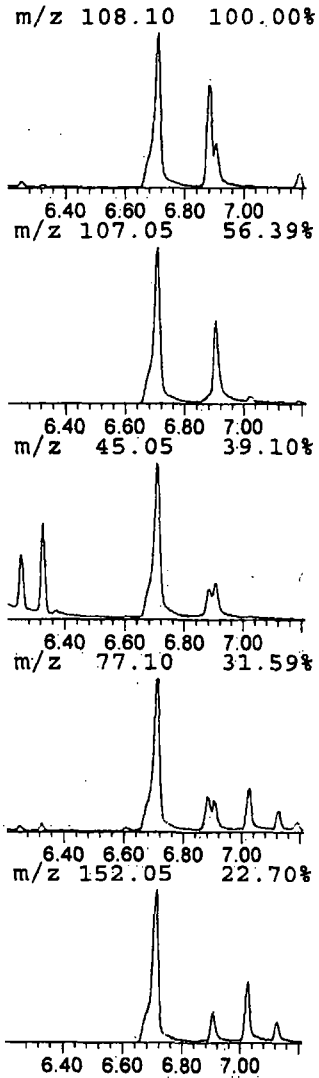
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****
Peak Number 8 Ethanol, 2-(4-methylphenoxy)- Concentration Rank 15

R.T.	EstConc	Area	Relative to ISTD	R.T.
6.711	7.31 ug/mL	4923330	Acenaphthene-d10	7.192

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Ethanol, 2-(4-methylphenoxy)-	152	C9H12O2	015149-10-7	52
2	Phenol, 4-(2-aminoethyl)-	137	C8H11NO	000051-67-2	49
3	Phenol, 3-methyl-	108	C7H8O	000108-39-4	49
4	Carbamic acid, N-phenyl-, 2-meth...	227	C14H13NO2	018312-43-1	47
5	Carbamic acid, methyl-, 3-methyl...	165	C9H11NO2	001129-41-5	47





Similar

MCHM012214.M Sun Jan 26 09:10:46 2014

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

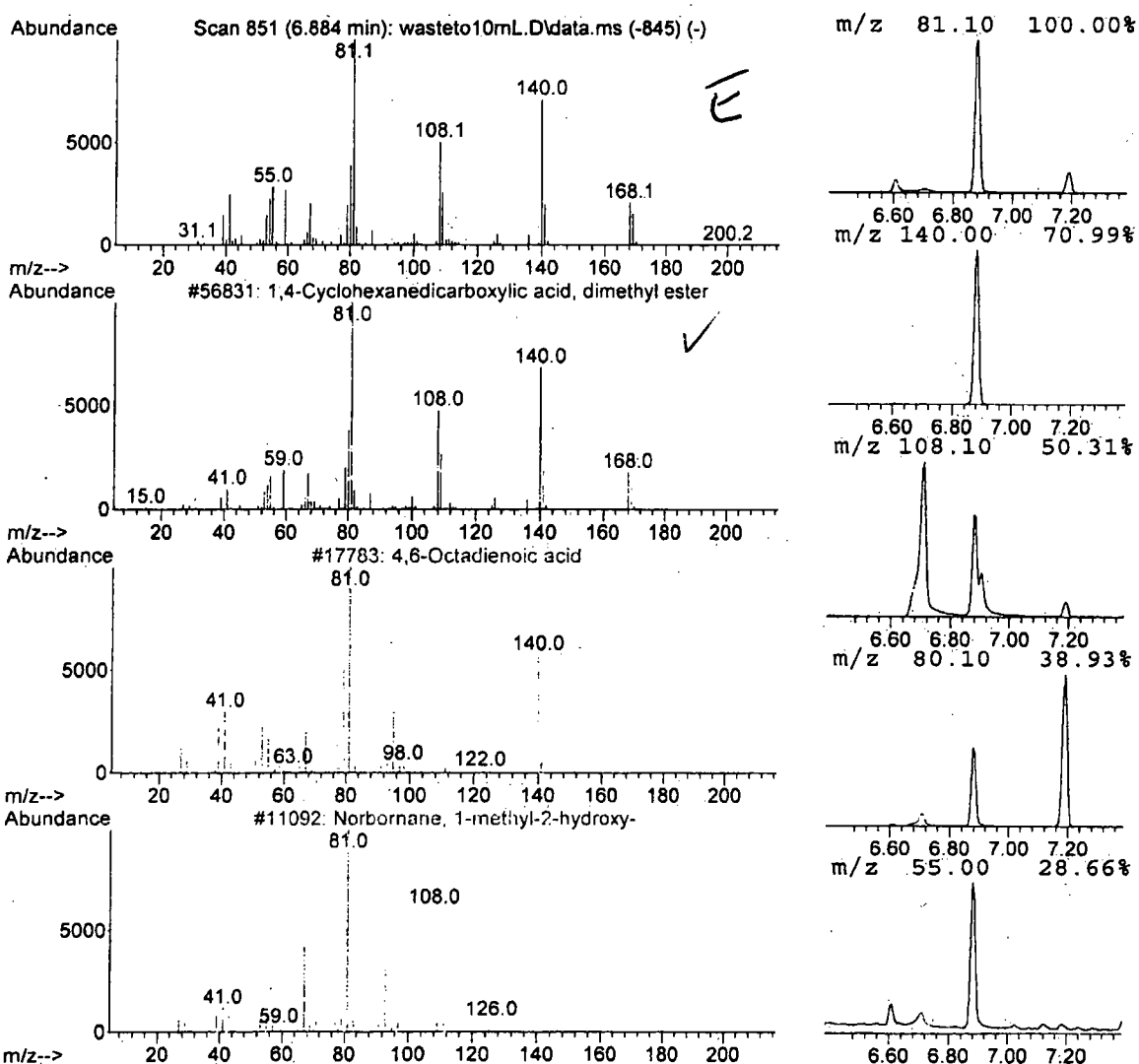
Dimethyl 1,4-cyclohexane dicarboxylate

****

Peak Number 9 1,4-Cyclohexanedicarboxylic... Concentration Rank 11

R.T.	EstConc	Area	Relative to ISTD	R.T.
6.884	9.60 ug/mL	6460130	Acenaphthene-d10	7.192

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	1,4-Cyclohexanedicarboxylic acid...	200	C10H16O4	000094-60-0	91
2	4,6-Octadienoic acid	140	C8H12O2	062765-17-7	38
3	Norbornane, 1-methyl-2-hydroxy-	126	C8H14O	1000197-58-0	37
4	Hexanedioic acid, 2-methyl-3-met...	200	C10H16O4	1000151-23-8	30
5	Imidazol-1-yl-acetic acid, methy...	140	C6H8N2O2	025023-22-7	27



Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

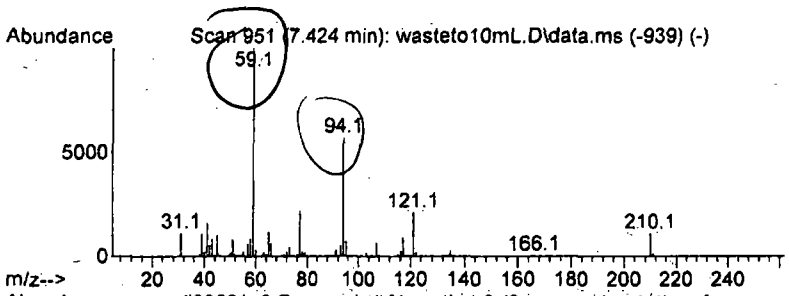
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

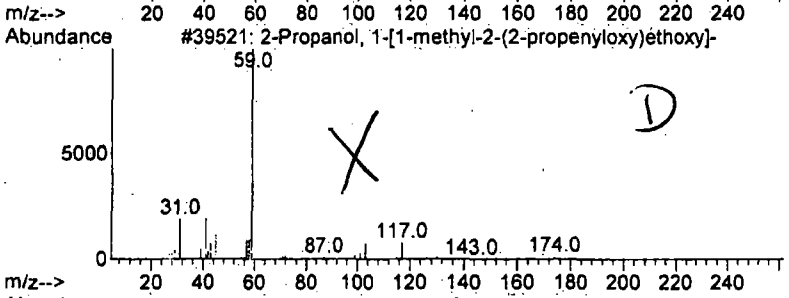
****
Peak Number 10 2-Propanol, 1-[1-methyl-2-(... Concentration Rank 4

R.T.	EstConc	Area	Relative to ISTD	R.T.
7.424	66.90 ug/mL	45037700	Acenaphthene-d10	7.192

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	2-Propanol, 1-[1-methyl-2-(2-pro...	174	C9H18O3	055956-25-7	35
2	Benzene, (2-methoxyethoxy)-	152	C9H12O2	041532-81-4	32
3	Carbonic acid, (3,4,4-trimethyl-...	252	C13H16O5	109123-69-5	27
4	2-Butanol, 2,3-dimethyl-	102	C6H14O	000594-60-5	25
5	2,3-Butanediol, 2,3-dimethyl-	118	C6H14O2	000076-09-5	25

UnKnown





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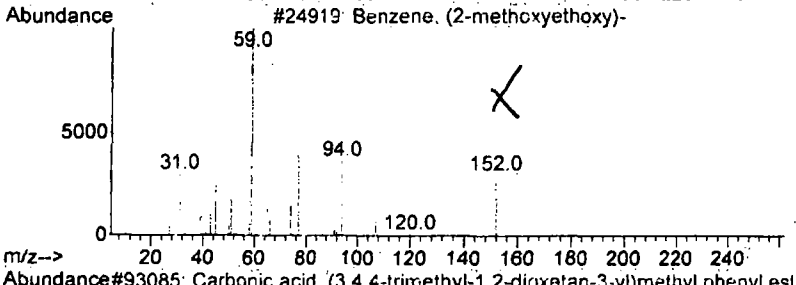
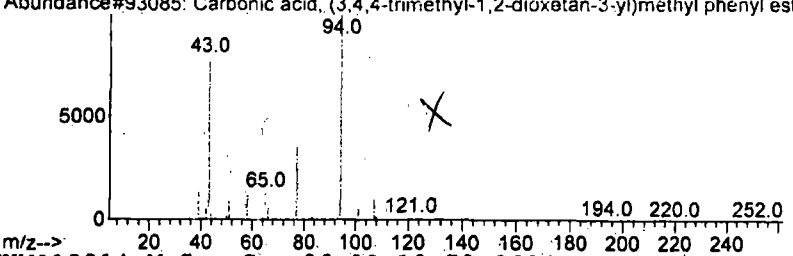
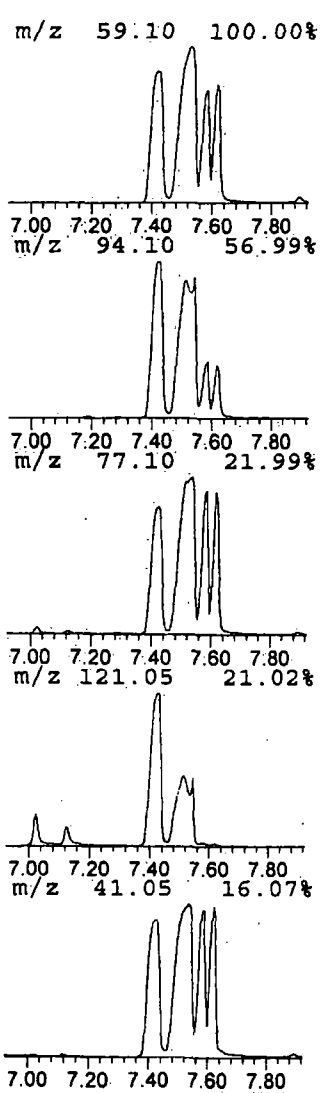


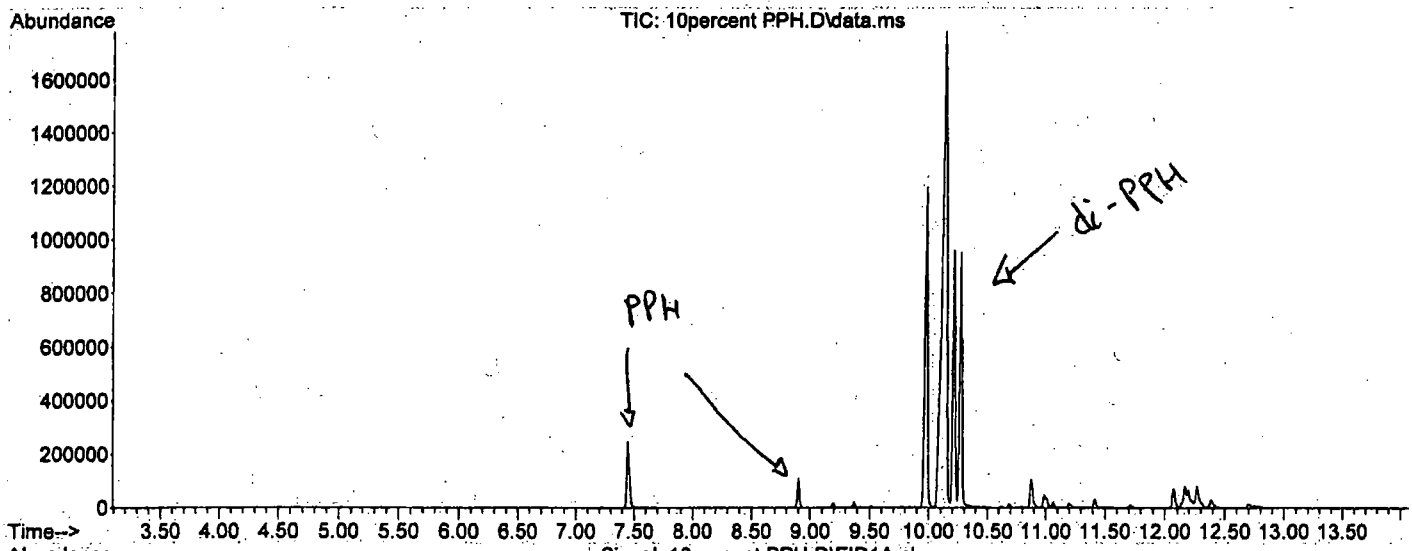


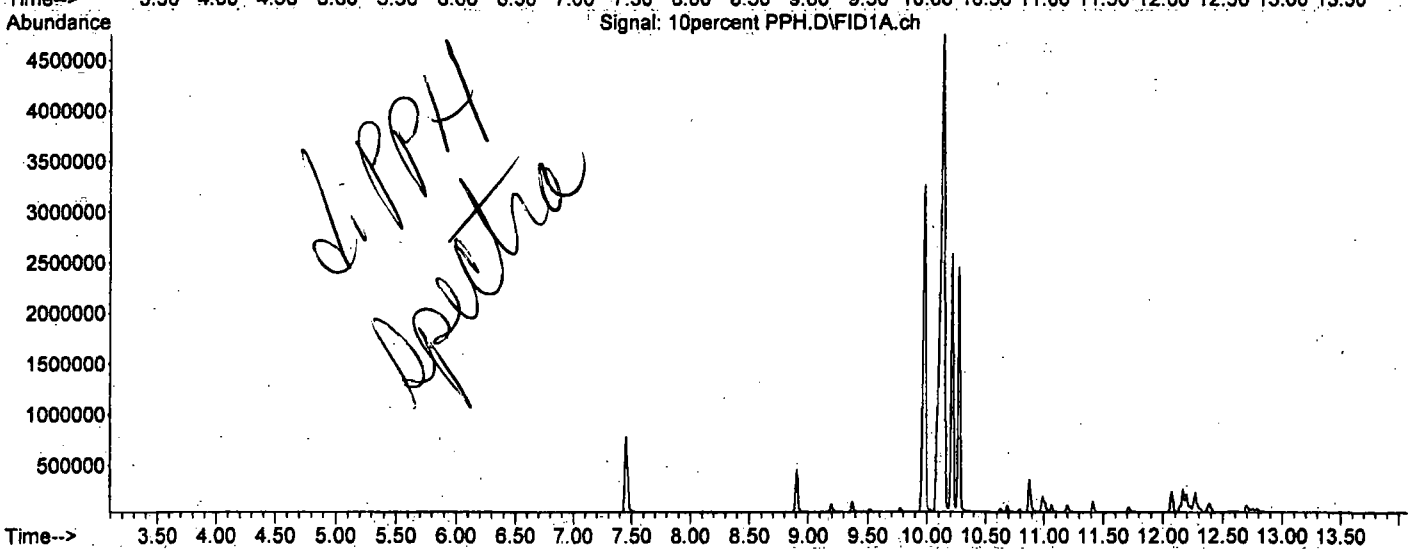


MCHM012214.M Sun Jan 26 09:10:52 2014

File :D:\DATA\1_11_14\10percent PPH.D
Operator :
Acquired : 22 Jan 2014 10:58 using AcqMethod GENERALAUTO-1.M
Instrument : GCMS #1
Sample Name: 10percent PPH
Misc Info :
Vial Number: 6

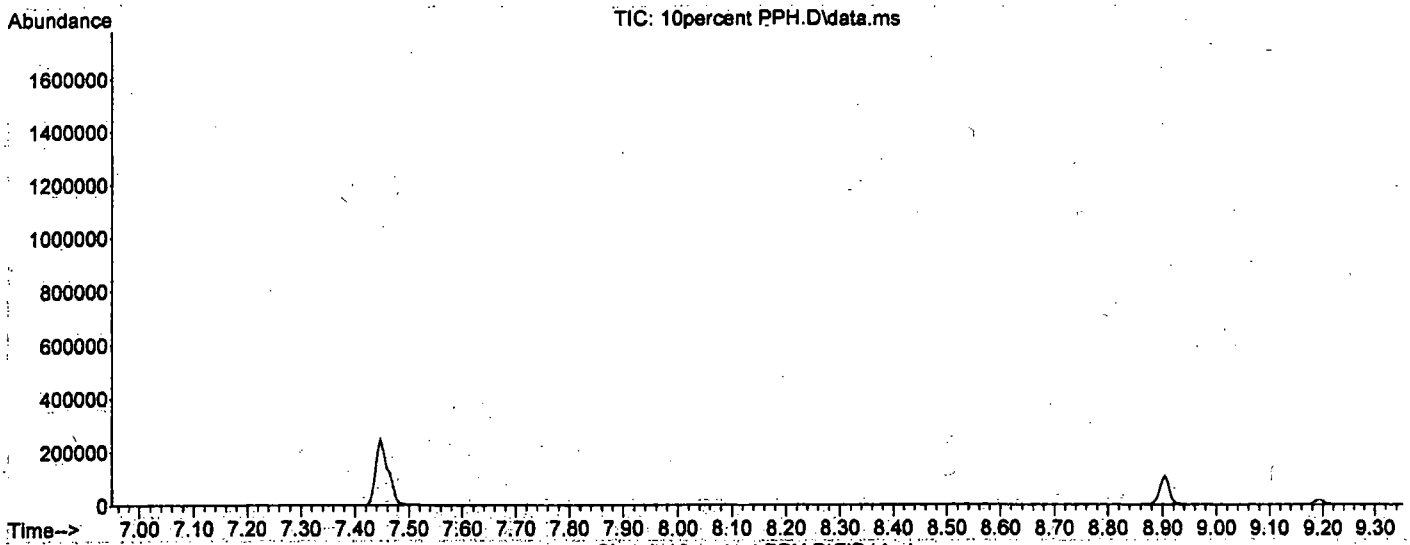
MATRIC

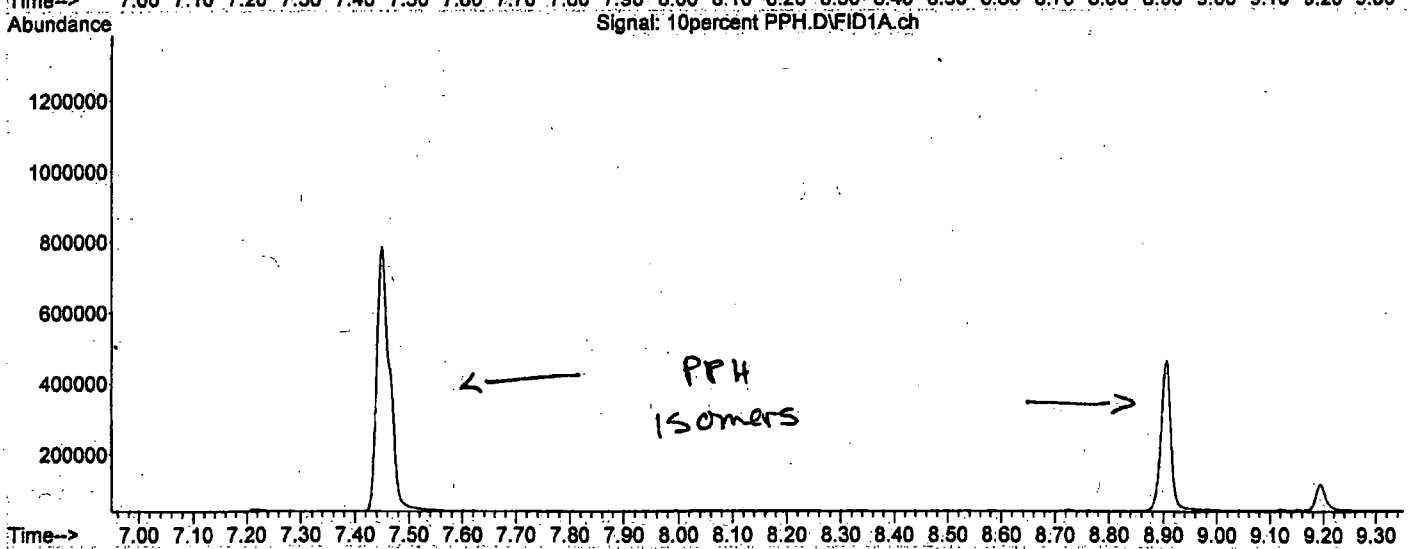


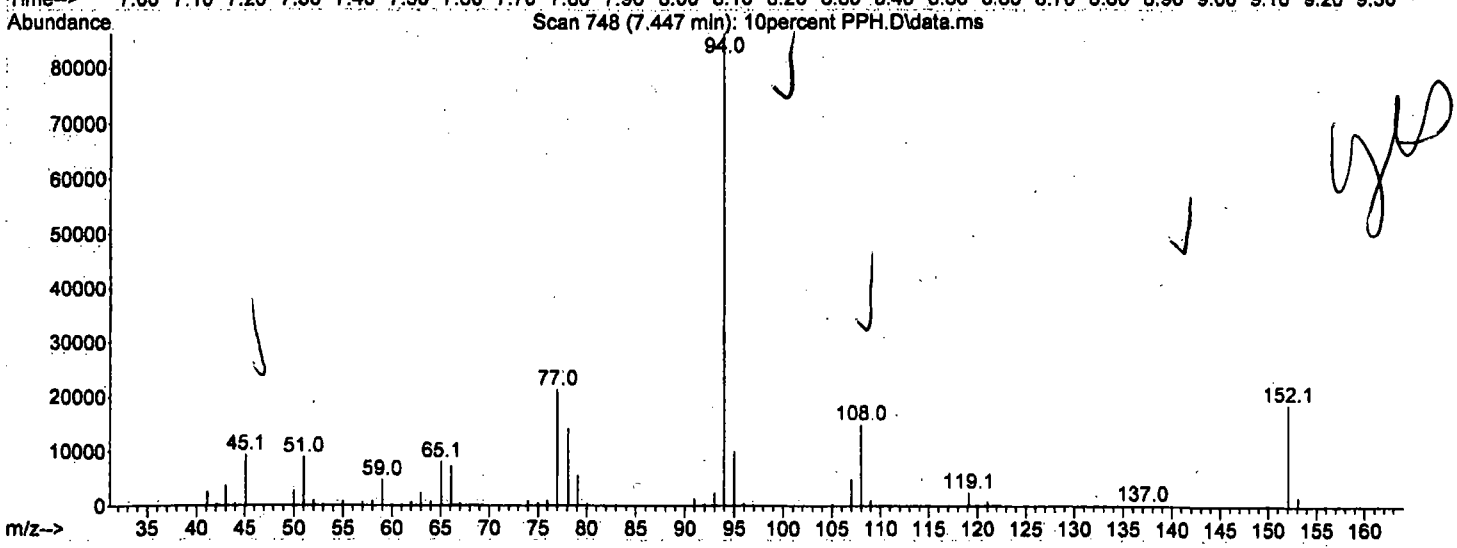


File :D:\DATA\1_11_14\10percent PPH.D
Operator :
Acquired : 22 Jan 2014 10:58 using AcqMethod GENERALAUTO-1.M
Instrument : GCMS #1
Sample Name: 10percent PPH
Misc Info :
Vial Number: 6

MATRIC

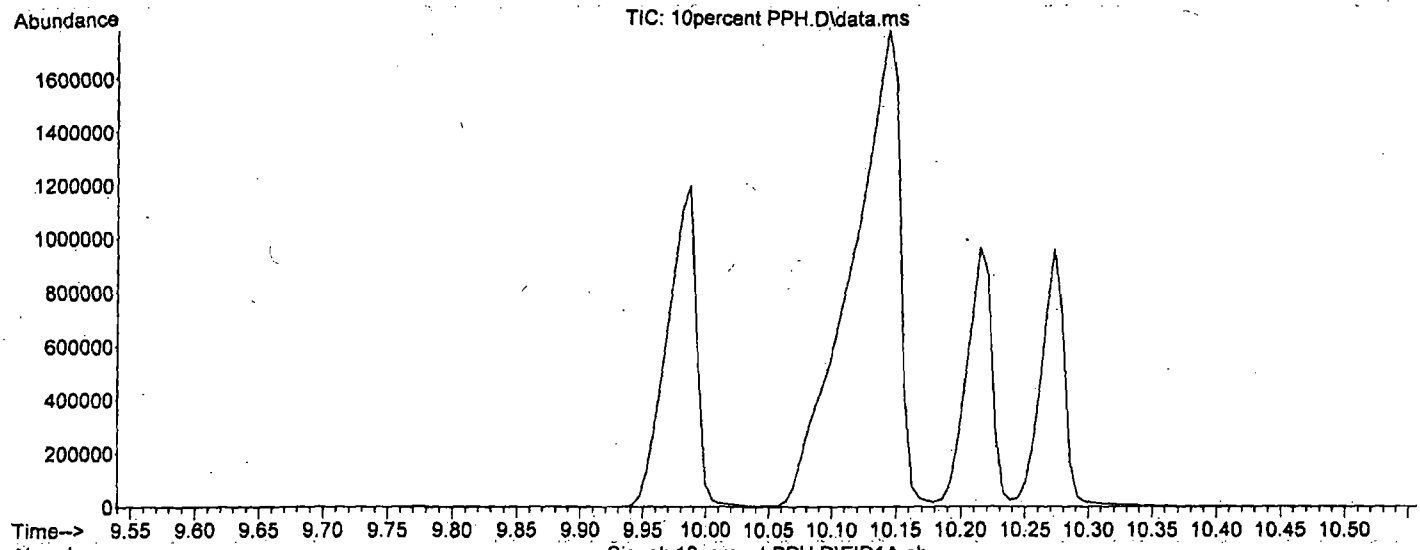


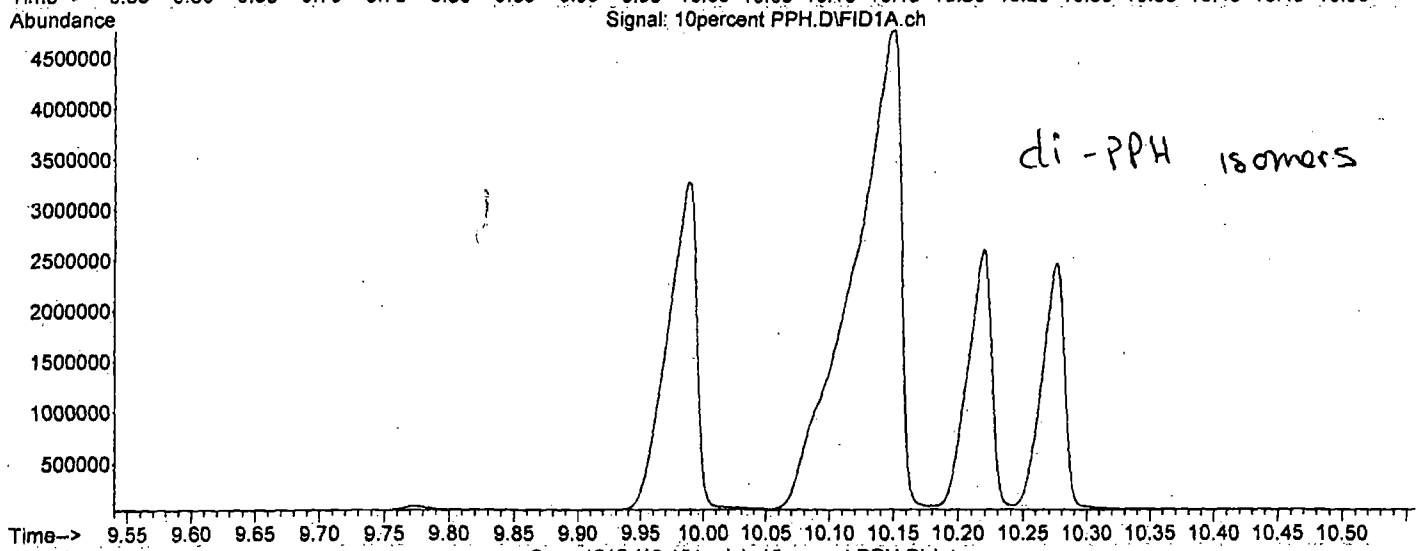




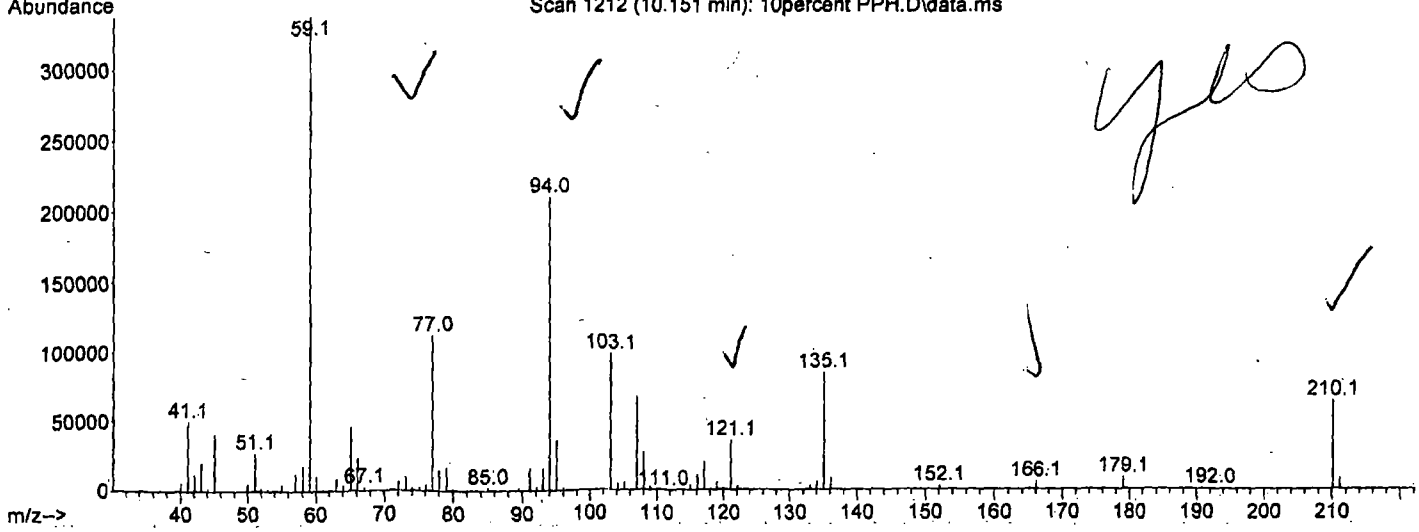
File :D:\DATA\1_11_14\10percent PPH.D
Operator :
Acquired : 22 Jan 2014 10:58 using AcqMethod GENERALAUTO-1.M
Instrument : GCMS #1
Sample Name: 10percent PPH
Misc Info :
Vial Number: 6

MATRIC





di-PPH isomers



Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

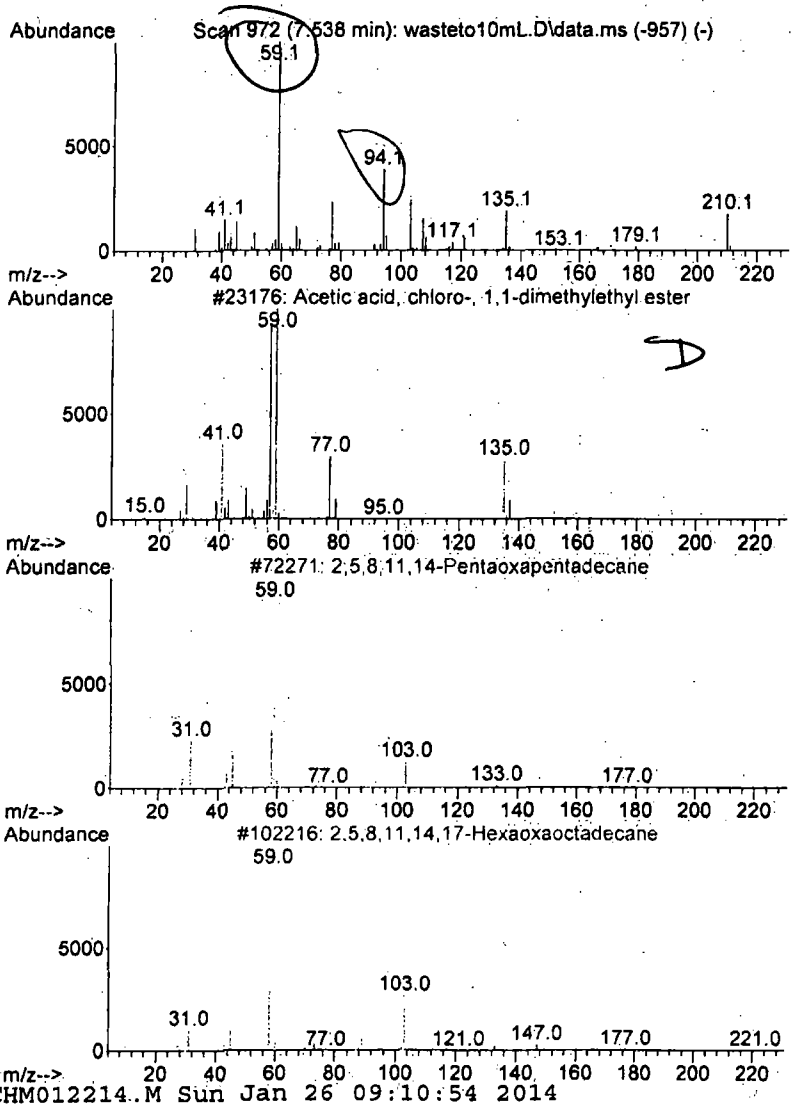
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

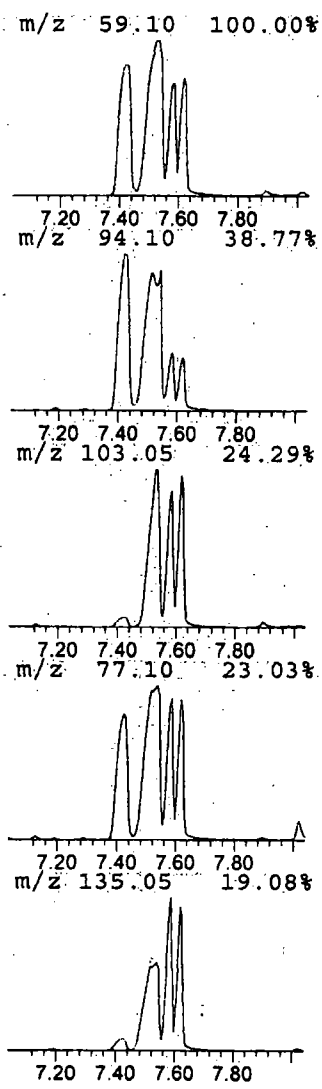
****

Peak Number 11 Acetic acid, chloro-, 1,1-d... Concentration Rank 1

R.T.	EstConc	Area	Relative to ISTD	R.T.
7.538	110.41 ug/mL	74325300	Acenaphthene-d10	7.192

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Acetic acid, chloro-, 1,1-dimeth...	150	C6H11ClO2	000107-59-5	37
2	2,5,8,11,14-Pentaoxapentadecane	222	C10H22O5	000143-24-8	35
3	2,5,8,11,14,17-Hexaoxaoctadecane	266	C12H26O6	001191-87-3	35
4	1-Propanol, 2-(2-hydroxypropoxy)-	134	C6H14O3	000106-62-7	35
5	2-Propanol, 1,1'-[(1-methyl-1,2-...	192	C9H20O4	001638-16-0	25





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Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

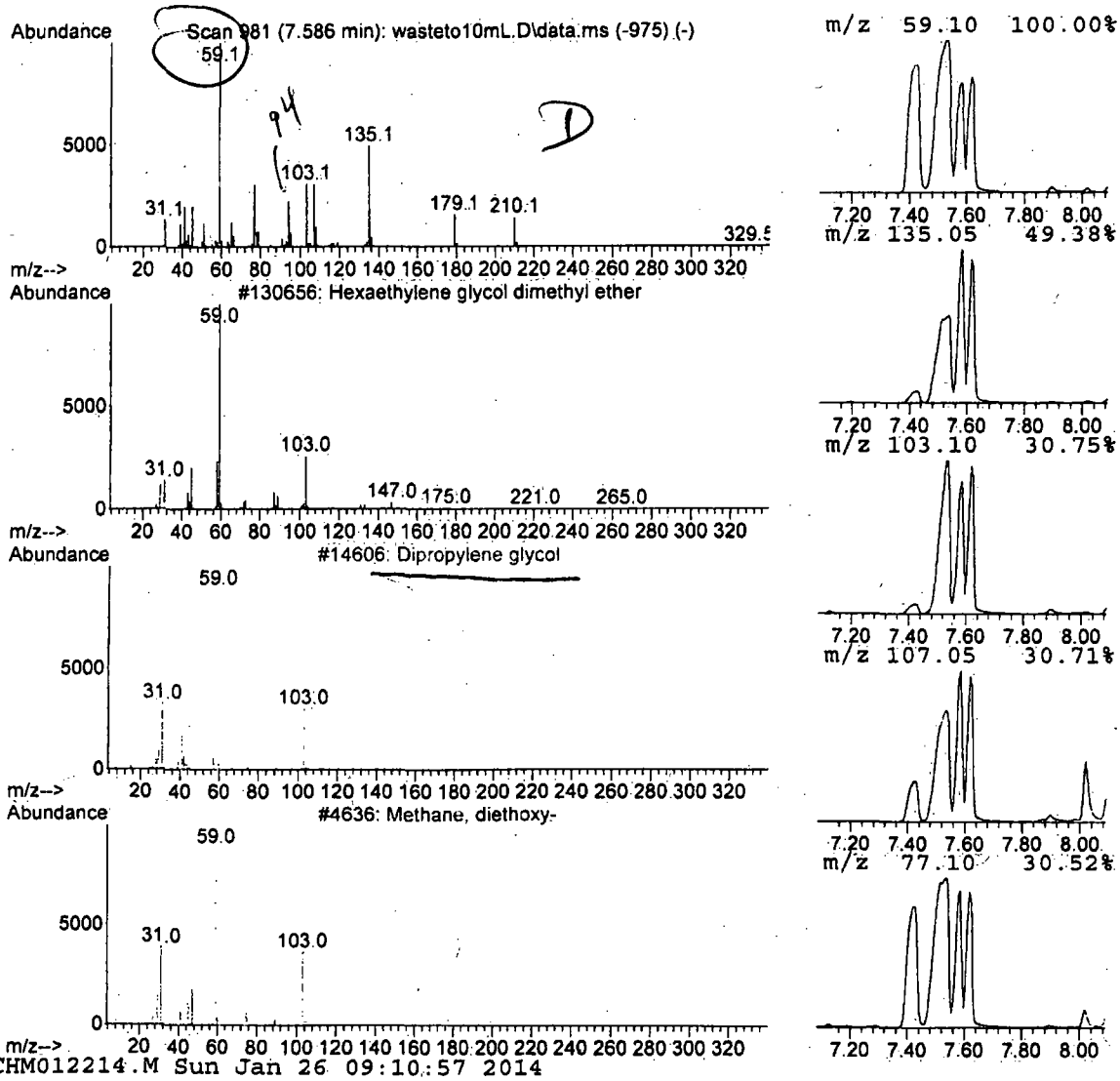
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****

Peak Number 12 Hexaethylene glycol dimethy... Concentration Rank 5

R.T.	EstConc	Area	Relative to ISTD	R.T.
7.586	39.55 ug/mL	26625200	Acenaphthene-d10	7.192

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Hexaethylene glycol dimethyl ether	310	C14H30O7	001072-40-8	35
2	Dipropylene glycol	134	C6H14O3	025265-71-8	35
3	Methane, diethoxy-	104	C5H12O2	000462-95-3	27
4	Propanamide, 2-hydroxy-2-methyl-...	179	C10H13NO2	002760-38-5	25
5	2-Propanol, 1-[1-methyl-2-(2-pro...	174	C9H18O3	055956-25-7	25



Unknown glycol

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

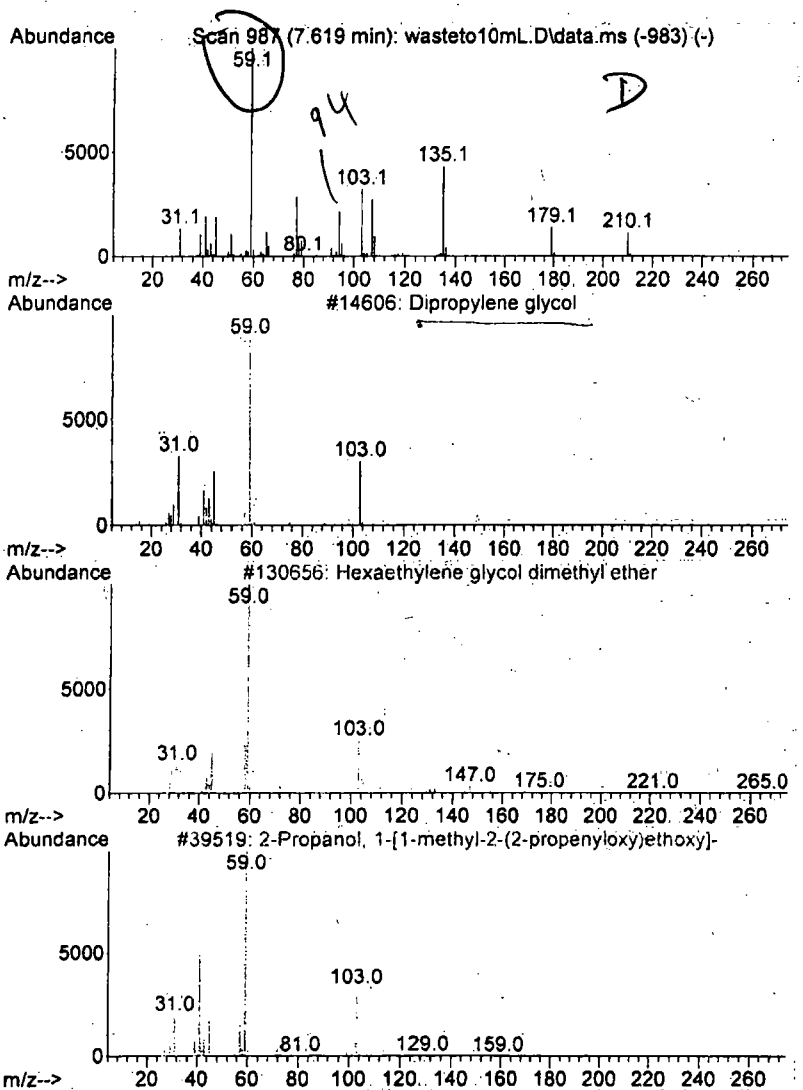
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

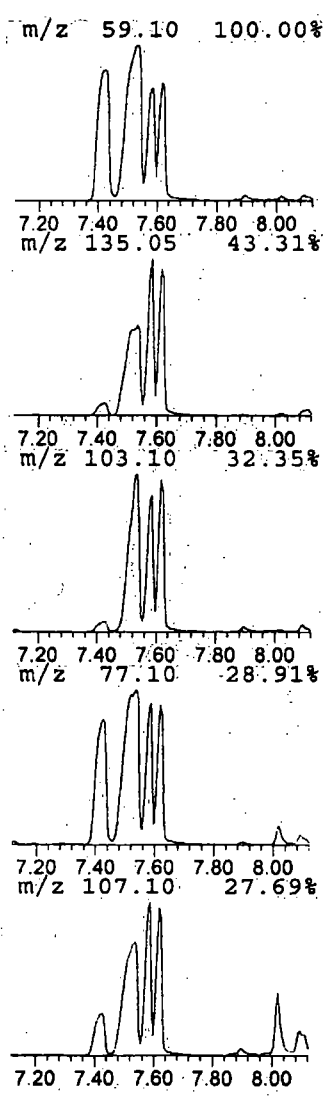
****

Peak Number 13 Dipropylene glycol Concentration Rank 7

R.T.	EstConc	Area	Relative to ISTD	R.T.
7.619	34.59 ug/mL	23286300	Acenaphthene-d10	7.192

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	Dipropylene glycol	134	C6H14O3	025265-71-8	35
2	Hexaethylene glycol dimethyl ether	310	C14H30O7	001072-40-8	35
3	2-Propanol, 1-[1-methyl-2-(2-pro...	174	C9H18O3	055956-25-7	25
4	1-Propanol, 2-(2-hydroxypropoxy)-	134	C6H14O3	000106-62-7	25
5	2,5,8,11,14-Pentaoxapentadecane	222	C10H22O5	000143-24-8	25





Unknown glycol

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

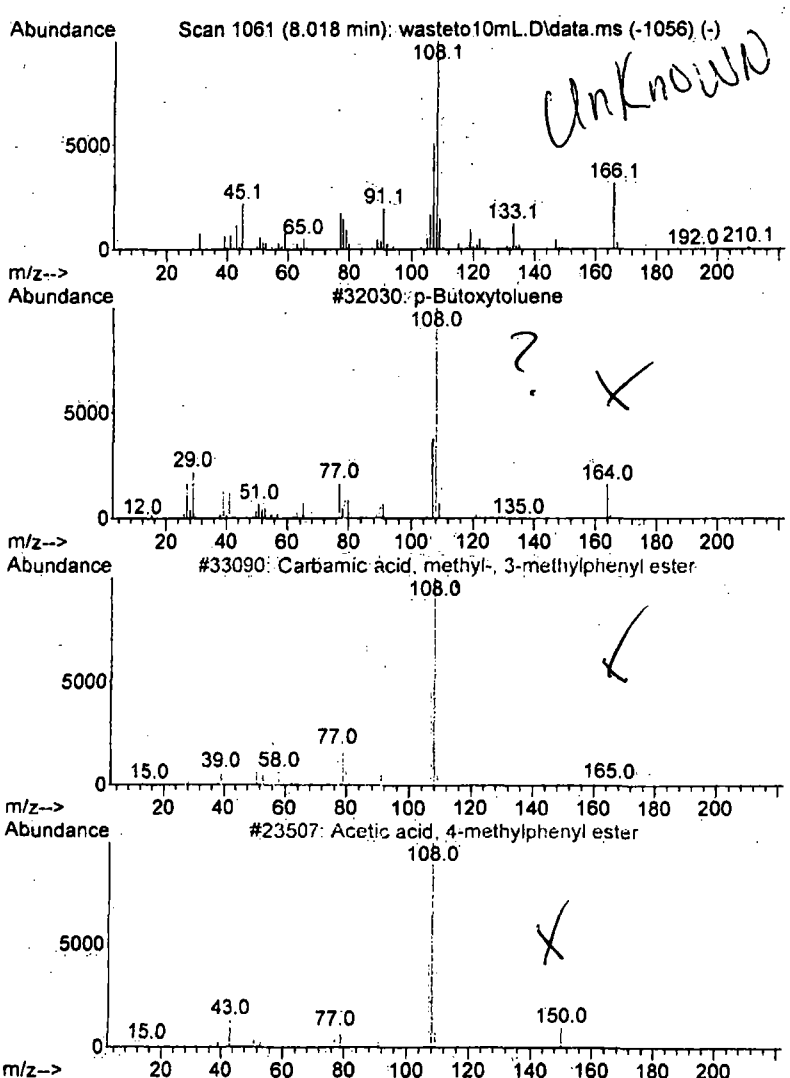
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

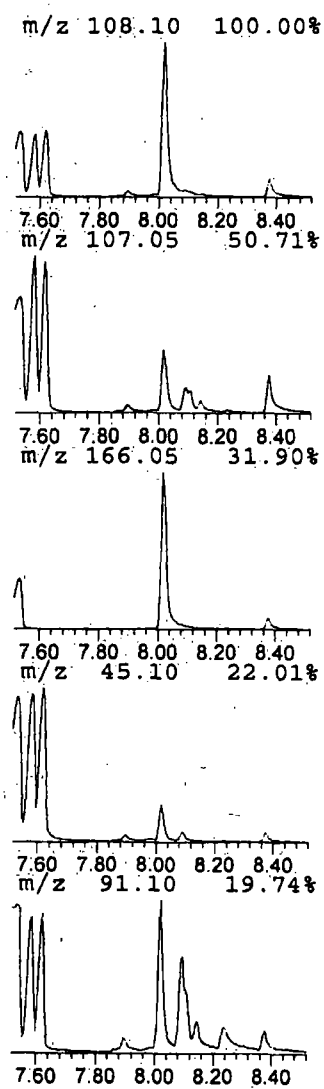
****

Peak Number 14 p-Butoxytoluene Concentration Rank 17

R.T.	EstConc	Area	Relative to ISTD	R.T.
8.018	6.64 ug/mL	4846010	Phenanthrene-d10	8.742

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	p-Butoxytoluene	164	C11H16O	010519-06-9	38
2	Carbamic acid, methyl-, 3-methyl...	165	C9H11NO2	001129-41-5	38
3	Acetic acid, 4-methylphenyl ester	150	C9H10O2	000140-39-6	38
4	L-Glutamine, N2-[(phenylmethoxy)...	280	C13H16N2O5	002650-64-8	38
5	Oxalic acid, hexyl 2-methylpheny...	264	C15H20O4	1000309-59-6	35





Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

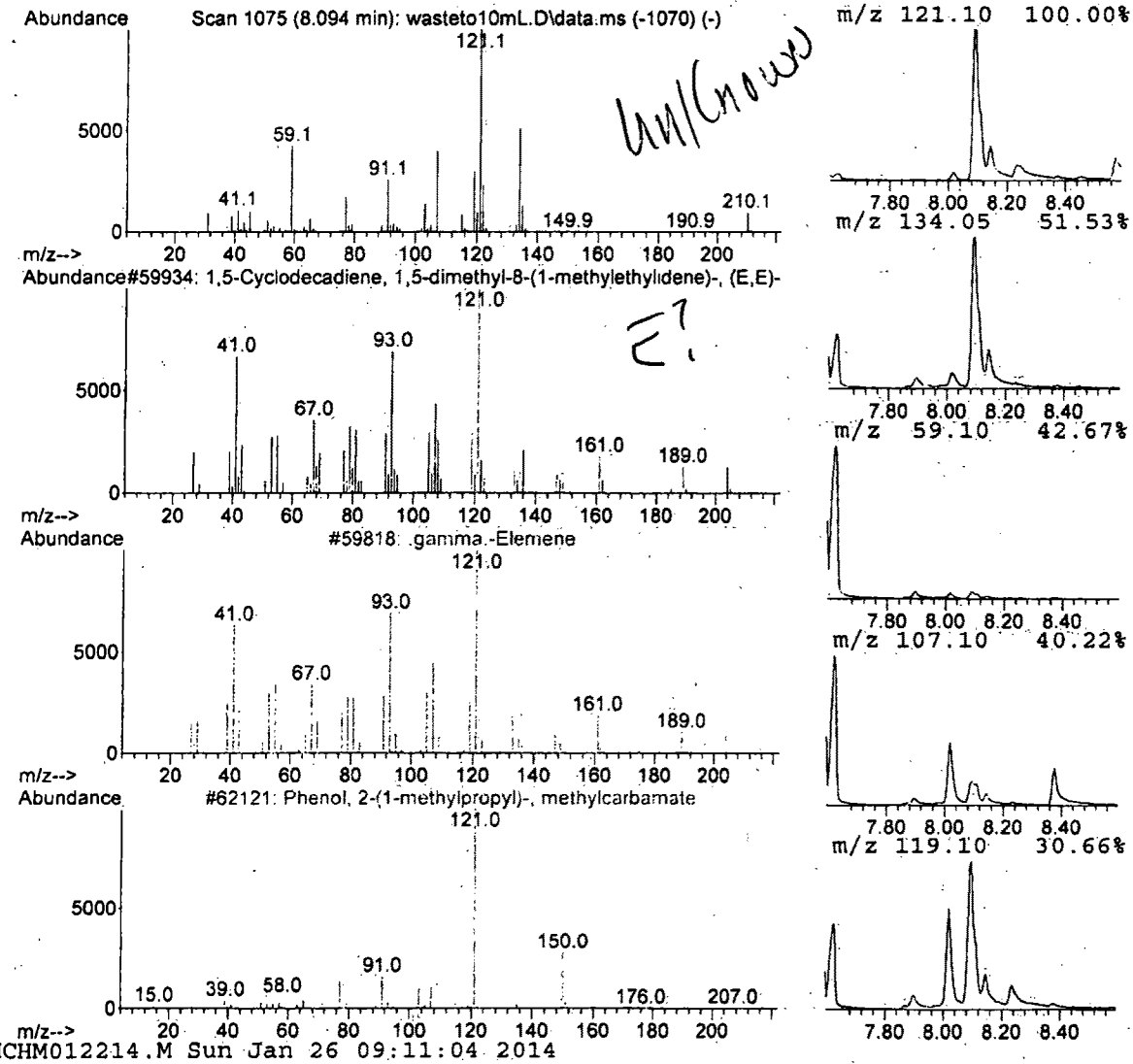
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****

Peak Number 15 1,5-Cyclodecadiene, 1,5-dim... Concentration Rank 19

R.T.	EstConc	Area	Relative to ISTD	R.T.
8.094	4.57 ug/mL	3334810	Phenanthrene-d10	8.742

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	1,5-Cyclodecadiene, 1,5-dimethyl...	204	C15H24	015423-57-1	50
2	.gamma.-Elemene	204	C15H24	030824-67-0	38
3	Phenol, 2-(1-methylpropyl)-, met...	207	C12H17NO2	003766-81-2	27
4	Cyclohexanol, 2-[2-pyridyl]-	177	C11H15NO	099858-60-3	25
5	Benzenamine, 2,6-dimethyl-	121	C8H11N	000087-62-7	22



Library Search Compound Report

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Data File : wastet010mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastet010mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

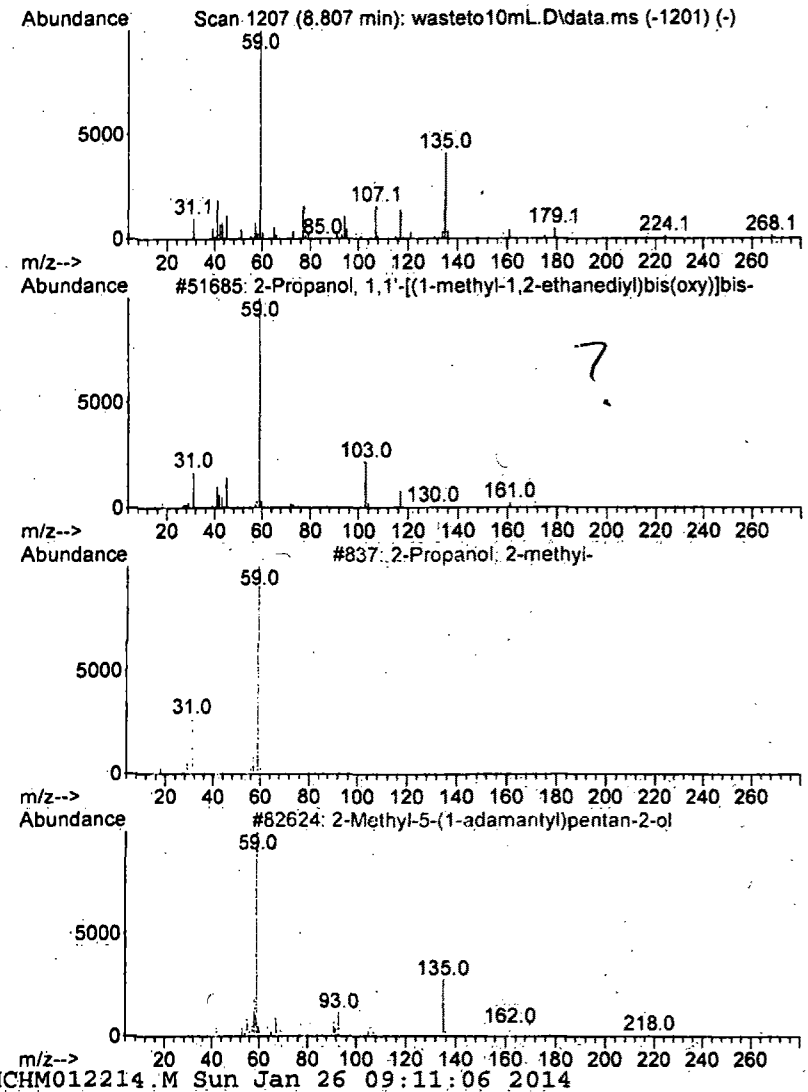
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

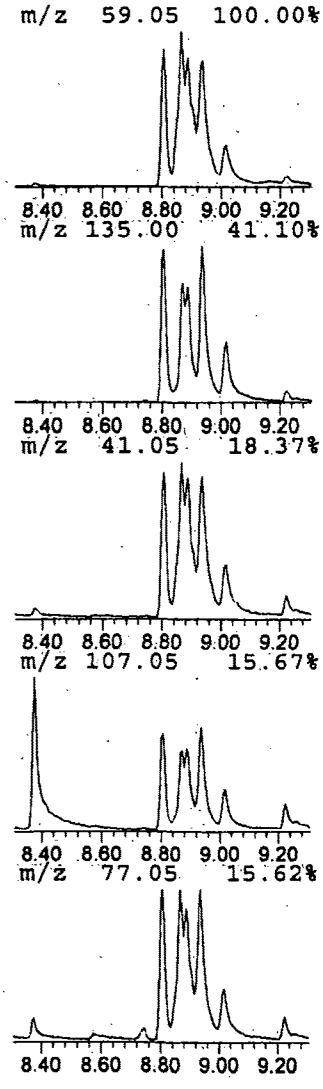
****

Peak Number 16 2-Propanol, 1,1'-[(1-methyl... Concentration Rank 18

R.T.	EstConc	Area	Relative to ISTD	R.T.
8.807	6.46 ug/mL	4714880	Phenanthrene-d10	8.742

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	2-Propanol, 1,1'-[(1-methyl-1,2-...	192	C9H20O4	001638-16-0	37
2	2-Propanol, 2-methyl-	74	C4H10O	000075-65-0	35
3	2-Methyl-5-(1-adamantyl)pentan-2-ol	236	C16H28O	095477-25-1	33
4	2-Propanol, 1-[2-(2-methoxy-1-me...	206	C10H22O4	020324-33-8	32
5	2,5,8,11,14-Pentaoxapentadecane	222	C10H22O5	000143-24-8	25





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Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

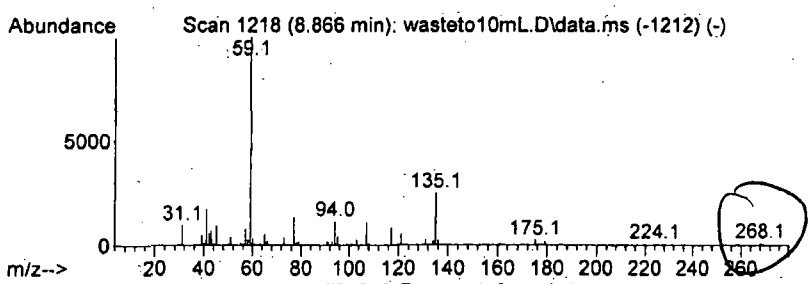
****

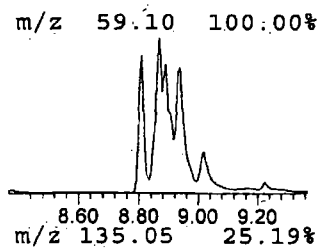
Peak Number 17 2-Propanol, 2-methyl- Concentration Rank 14

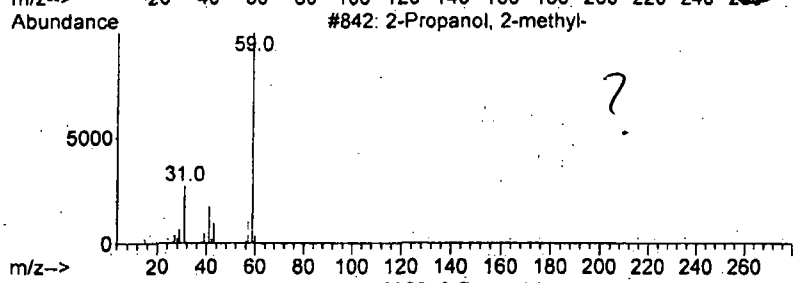
R.T.	EstConc	Area	Relative to ISTD	R.T.
8.866	7.56 ug/mL	5516590	Phenanthrene-d10	8.742

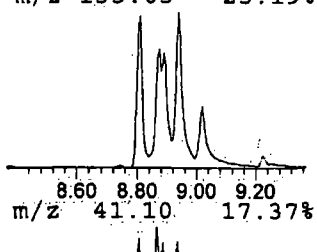
Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	2-Propanol, 2-methyl-	74	C4H10O	000075-65-0	38
2	3-Pentanol	88	C5H12O	000584-02-1	38
3	Butanamide, 3-methyl-	101	C5H11NO	000541-46-8	37
4	2-Propanol, 1,1'-[(1-methyl-1,2-...	192	C9H20O4	001638-16-0	37
5	2-Propanol, 1-[1-methyl-2-(2-pro...	174	C9H18O3	055956-25-7	37

Unknown alcohol









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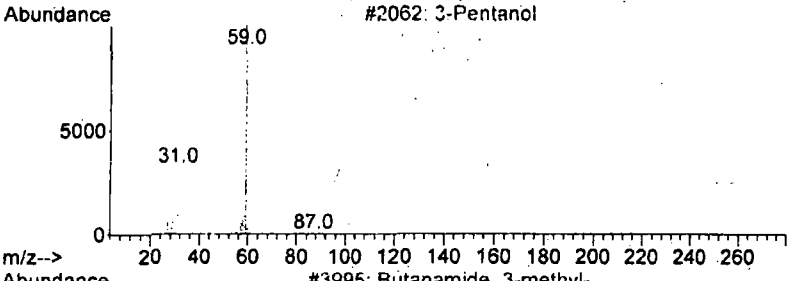
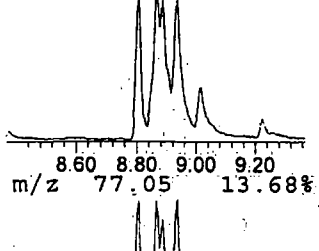
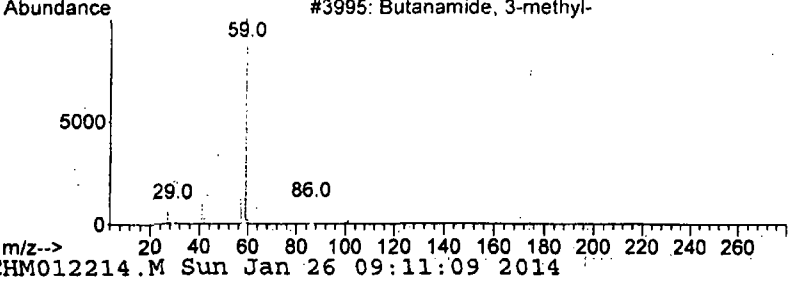
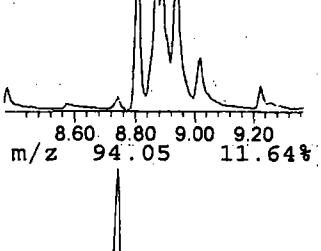
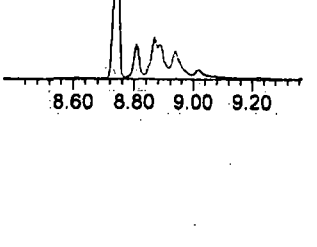










Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

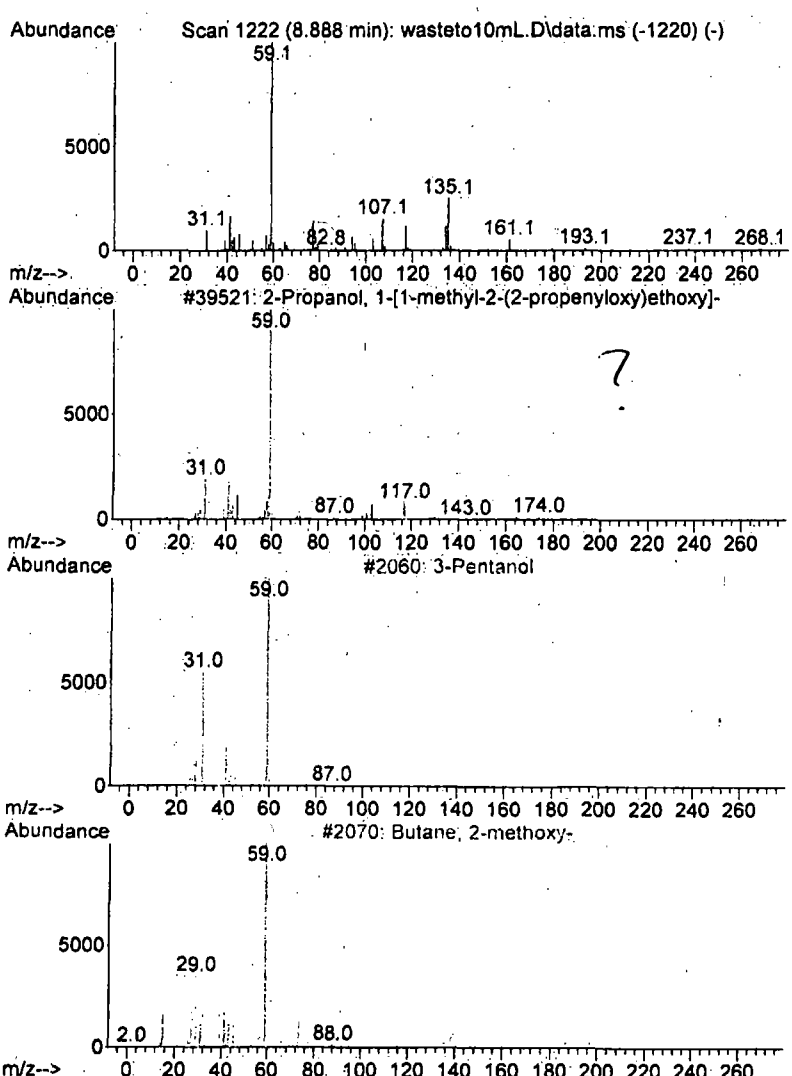
Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

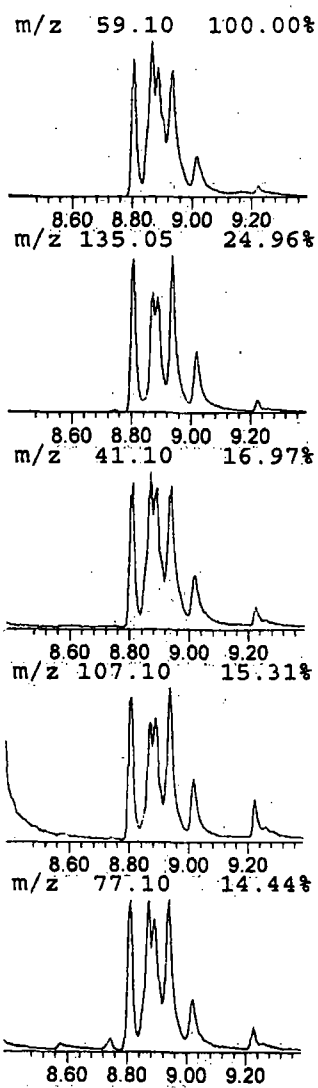
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

****
Peak Number 18 2-Propanol, 1-[1-methyl-2-(... Concentration Rank 16

R.T.	EstConc	Area	Relative to ISTD	R.T.
8.888	6.85 ug/mL	4993630	Phenanthrene-d10	8.742

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	2-Propanol, 1-[1-methyl-2-(2-pro...	174	C9H18O3	055956-25-7	38
2	3-Pentanol	88	C5H12O	000584-02-1	32
3	Butane, 2-methoxy-	88	C5H12O	006795-87-5	32
4	Acetic acid, chloro-, 1,1-dimeth...	150	C6H11ClO2	000107-59-5	28
5	2-Propanol, 1,1'-[(1-methyl-1,2-...	192	C9H20O4	001638-16-0	25





Unknown alcohol

MCHM012214.M Sun Jan 26 09:11:12 2014

Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

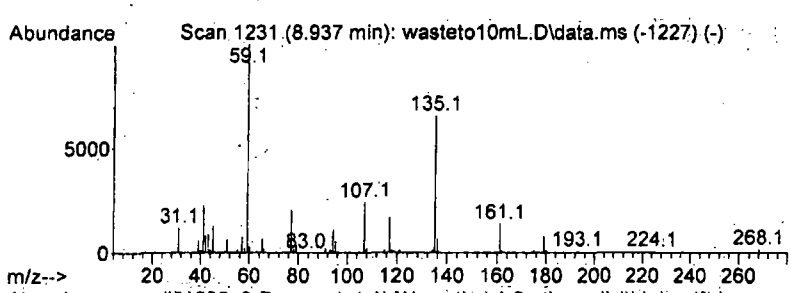
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

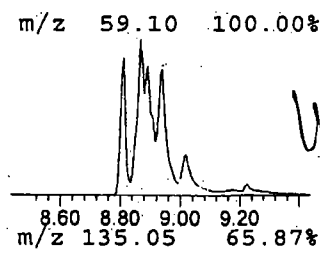
****

Peak Number 19 2-Propanol, 1,1'-[(1-methyl... Concentration Rank 12

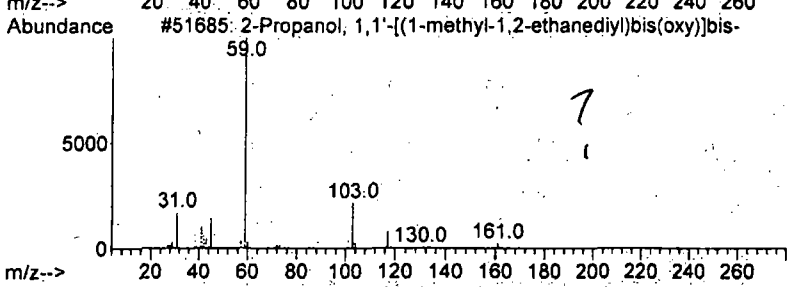
R.T.	EstConc	Area	Relative to ISTD	R.T.
8.937	8.92 ug/mL	6503070	Phenanthrene-d10	8.742

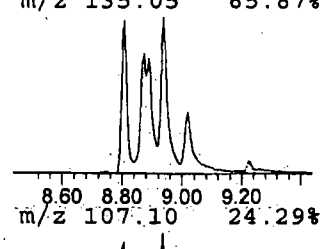
Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	2-Propanol, 1,1'-[(1-methyl-1,2-...	192	C9H2004	001638-16-0	27
2	Hydrazine, 1-butyl-1-methyl-	102	C5H14N2	020240-62-4	27
3	2-Propanol, 2-methyl-	74	C4H10O	000075-65-0	27
4	2-Butanol, 2,3-dimethyl-	102	C6H14O	000594-60-5	27
5	s-Trioxane, 2,4,6-triethyl-	174	C9H18O3	002396-42-1	25

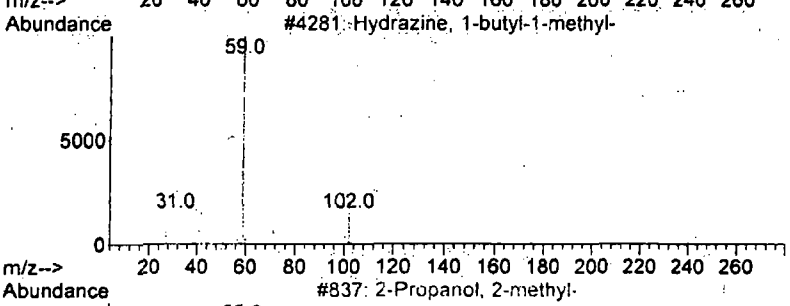


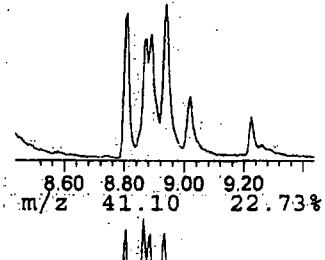


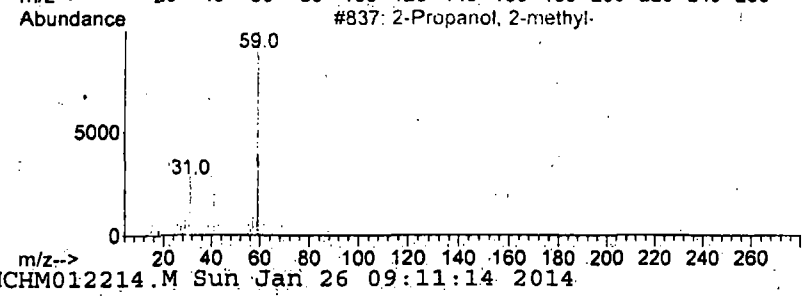
unknown alcohol

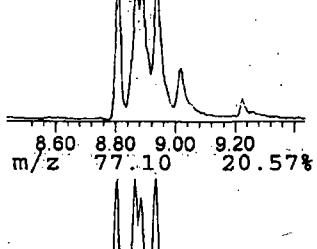


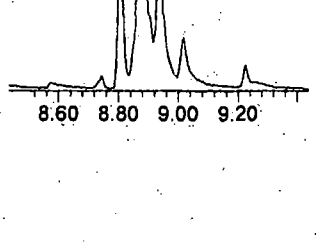












Library Search Compound Report

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wasteto10mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wasteto10mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

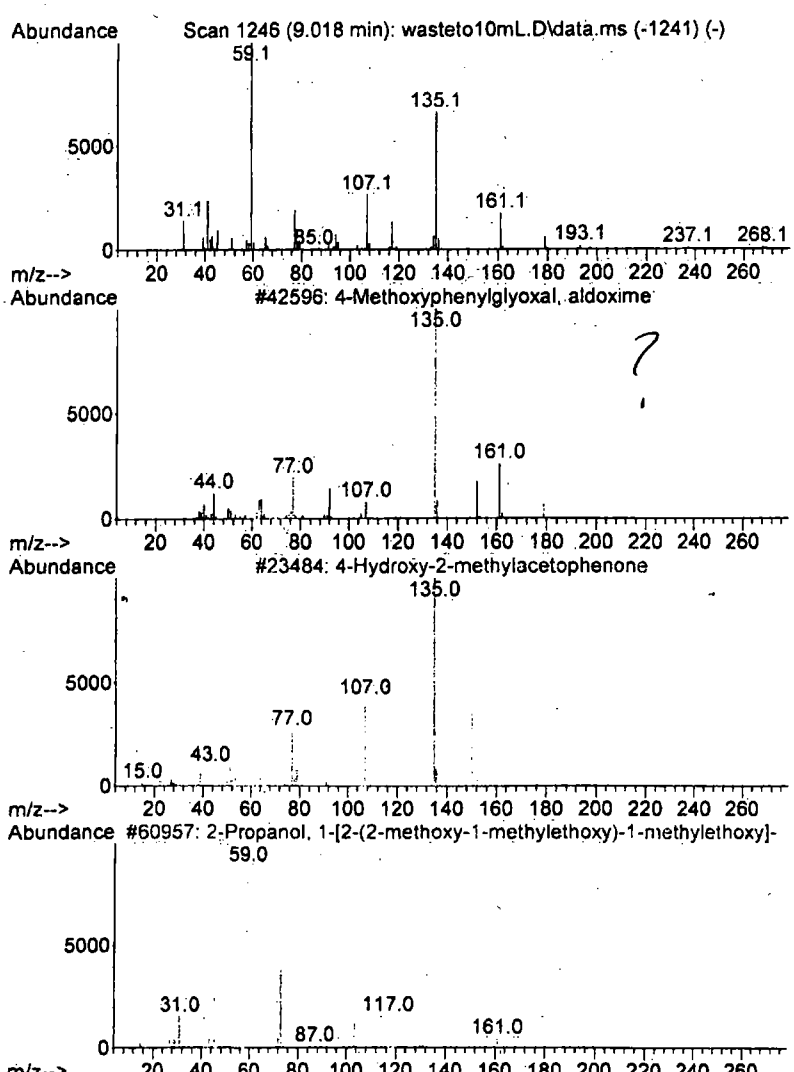
TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

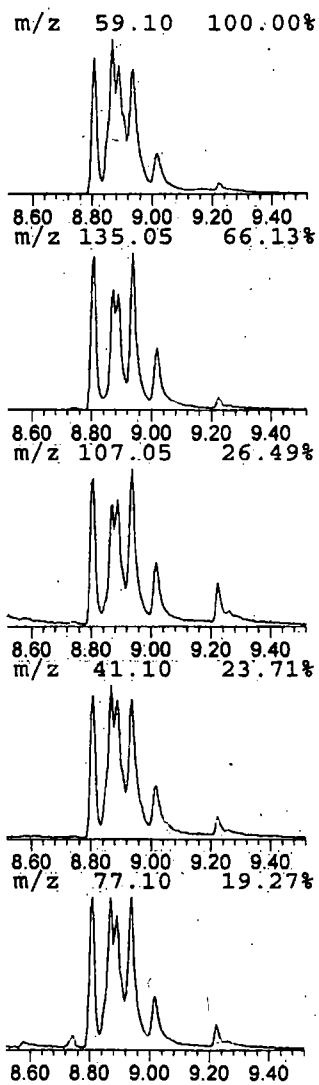
****

Peak Number 20 4-Methoxyphenylglyoxal, ald... Concentration Rank 20

R.T.	EstConc	Area	Relative to ISTD	R.T.
9.018	3.42 ug/mL	2491300	Phenanthrene-d10	8.742

Hit# of 5	Tentative ID	MW	MolForm	CAS#	Qual
1	4-Methoxyphenylglyoxal, aldoxime	179	C9H9NO3	1000306-61-2	30
2	4-Hydroxy-2-methylacetophenone	150	C9H10O2	000875-59-2	27
3	2-Propanol, 1-[2-(2-methoxy-1-me...	206	C10H22O4	020324-33-8	25
4	2-Propanol, 1,1'-[(1-methyl-1,2-...	192	C9H20O4	001638-16-0	25
5	Formamide, N-methyl-N-phenyl-	135	C8H9NO	000093-61-8	22





ug/L w/ 1000 2 ISTD added

MCHM012214.M Sun Jan 26 09:11:17 2014

Tentatively Identified Compound (LSC) summary

Data Path : D:\DATA\SVOC\2014\01 JAN\012514B\
Data File : wastetol0mL.D
Acq On : 26 Jan 2014 12:54 am
Operator : ERG 96-5975B
Sample : wastetol0mL
Misc : Waste Dilution Crude Extract
ALS Vial : 16 Sample Multiplier: 1

Quant Method : D:\DATA\SVOC\calibrations\MCHM012214.M
Quant Title : Calibration

TIC Library : C:\Database\NIST05a.L
TIC Integration Parameters: LSCINT.P

TIC Top Hit name	RT	EstConc	Units	Response	--Internal Standard--- #	RT	Resp	Conc
Cyclohexanemeth...	4.080	11.7	ug/mL	16553100	1	4.145	28282900	20.0
Cyclohexanemeth...	4.545	103.4	ug/mL	146281000	1	4.145	28282900	20.0
Cyclohexanecarb...	4.880	20.6	ug/mL	14282100	2	5.377	13834700	20.0
Hexanoic acid, ...	4.923	13.2	ug/mL	9127780	2	5.377	13834700	20.0
1-Phenoxypropan...	5.706	8.7	ug/mL	6012530	2	5.377	13834700	20.0
1-Hydroxymethyl...	6.047	101.5	ug/mL	70177800	2	5.377	13834700	20.0
1-Hydroxymethyl...	6.111	35.8	ug/mL	24762600	2	5.377	13834700	20.0
Ethanol, 2-(4-m...	6.711	7.3	ug/mL	4923330	3	7.192	13463800	20.0
1,4-Cyclohexane...	6.884	9.6	ug/mL	6460130	3	7.192	13463800	20.0
2-Propanol, 1-[...	7.424	66.9	ug/mL	45037700	3	7.192	13463800	20.0
Acetic acid, ch...	7.538	110.4	ug/mL	74325300	3	7.192	13463800	20.0
Hexaethylene gl...	7.586	39.6	ug/mL	26625200	3	7.192	13463800	20.0
Dipropylene glycol	7.619	34.6	ug/mL	23286300	3	7.192	13463800	20.0
p-Butoxytoluene	8.018	6.6	ug/mL	4846010	4	8.742	14588500	20.0
1,5-Cyclodecadi...	8.094	4.6	ug/mL	3334810	4	8.742	14588500	20.0
2-Propanol, 1,1...	8.807	6.5	ug/mL	4714880	4	8.742	14588500	20.0
2-Propanol, 2-m...	8.866	7.6	ug/mL	5516590	4	8.742	14588500	20.0
2-Propanol, 1-[...	8.888	6.8	ug/mL	4993630	4	8.742	14588500	20.0
2-Propanol, 1,1...	8.937	8.9	ug/mL	6503070	4	8.742	14588500	20.0
4-Methoxyphenyl...	9.018	3.4	ug/mL	2491300	4	8.742	14588500	20.0

Ex. 5 - Deliberative

P.O.

EP-14-3-000007

12-5-13

by Ryan Parker

PR-R3-13-00354

P&P 12-5-13 to 12-3-14

$12,257

Ex. 5 - Deliberative

Warner, Sue

From: Gray, Wendy
Sent: Tuesday, February 04, 2014 1:04 PM
To: Warner, Sue
Subject: FW: MCHM & PPH Product TICs

Sue,
Can you help with response to Eric's questions about the preliminary VOC a

Has it been determined that that each of the peaks can be attributed to an
Also, how many peaks are being observed for cyclohexanemethanol?
Is the analysis able to separate the cis and trans isomers? Yes

Ex. 5 - Deliberative

Thanks.
Wendy

From: Weber, Eric
Sent: Tuesday, February 04, 2014 10:46 AM
To: Gray, Wendy; Magnuson, Matthew; Allgeier, Steve; Hedrick, Elizabeth; Arguto, William
Cc: Sayles, Gregory
Subject: RE: MCHM & PPH Product TICs

Wendy,

I have a couple of questions concerning the compounds listed below in Mathew's email. It is mentioned that dipropylene glycol phenyl ether has 4 peaks. Has it been determined that that each of the peaks can be attributed to an isomer of dipropylene glycol phenyl ether? Also, how many peaks are being observed for cyclohexanemethanol? Is the analysis able to separate the cis and trans isomers?

Thanks,

Eric

From: Gray, Wendy
Sent: Monday, February 03, 2014 11:56 AM
To: Magnuson, Matthew; Weber, Eric; Allgeier, Steve; Hedrick, Elizabeth; Arguto, William
Cc: Sayles, Gregory
Subject: RE: MCHM & PPH Product TICs

Matt,
The list that you have would be our preliminary list of chemicals in the tank with the exception that there was one more unknown identified by the VOC analysis:
Unknown, masses, masses 79, 94, 55 and 67

I think that there are really two questions that need to be answered.

1) What are potential TICs associated with chlorine disinfection of the list of preliminary chemicals in the tank?
2) Description of formaldehyde, reasons that it may have been found in drinking water, and likelihood of formation as byproduct of disinfection.

Ex. 5 - Deliberative

Based upon Eric Weber's email from earlier this morning, it looks like he may be getting some good traction at least on the first topic. Matt, can you talk directly with Eric to discuss the status of the two questions. Could potentially have you both divide and conquer, if already working on different aspects of the question.

I am going to tentatively set a call for tomorrow afternoon (first available time to collectively gather this distribution list), but there is a briefing tomorrow morning that may or may not make this discussion necessary/relevant.

Thanks!

Wendy Gray, P.E.
Environmental Engineer
US EPA Region III
Drinking Water Branch
1650 Arch Street (3WP21)
Philadelphia, PA 19103
Office: (215) 814-5673
Cell: (267) 216-6521
Fax: (215) 814-2302
Gray.Wendy@EPA.gov

From: Magnuson, Matthew
Sent: Monday, February 03, 2014 11:10 AM
To: Weber, Eric; Gray, Wendy; Allgeier, Steve; Hedrick, Elizabeth; Arguto, William
Cc: Sayles, Gregory
Subject: RE: MCHM & PPH Product TICs

Wendy,

Are you asking about more detail on the compounds marked "possible" and "unknown" in the list you sent, which I've pasted below?

Or for other chemicals that might be there based on the manufacturing processes for the CHM and the PPH?

Both are rather difficult questions based on the provided MSDSs and the table below, and will always have some large uncertainties. The situation is further complicated by not knowing what that tank has been used for over the years, or even recently. We didn't even know about the PPH for a while.

Is there a specific question we can focus on? For instance, --whether the list below is reasonable? –are there other analysis or reanalysis of the extract that might be beneficial? –a description of alternative ways formaldehyde could end up in the drinking water sample other than coming from something in the tank? –a description of difficulties with formaldehyde analysis?

Thanks.
Matthew

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Warner, Sue

Subject: FW: MCHM TICs discussion
Location: Conf Call listed below

Start: Tue 2/4/2014 2:00 PM
End: Tue 2/4/2014 2:30 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Organizer: Gray, Wendy

Ex. 5 - Deliberative

Eric,
Here is the meeting info. Ex. 5 - Deliberative
Cindy

-----Original Appointment-----
From: Gray, Wendy
Sent: Monday, February 03, 2014 12:13 PM
To: Gray, Wendy; Allgeier, Steve; Magnuson, Matthew; Arguto, William; Weber, Eric; Caporale, Cynthia; binetti, victoria
Cc: Hedrick, Elizabeth; Warner, Sue
Subject: MCHM TICs discussion
When: Tuesday, February 04, 2014 2:00 PM-2:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Conf Call listed below

Ex. 5 - Deliberative

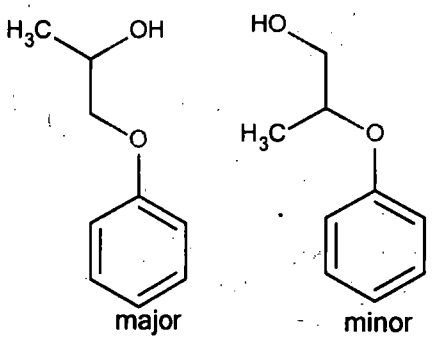
To discuss status of potential disinfectant byproduct TICs

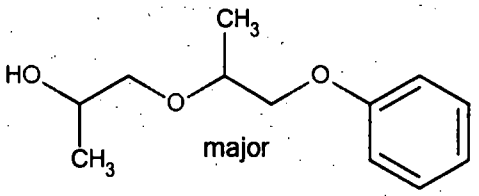
Conference Line

Ex. 6 - Personal Privacy

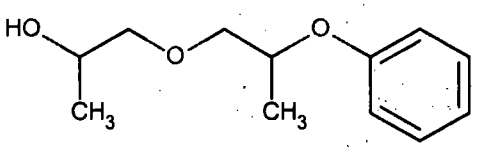
Ex. 5 - Deliberative

Propylene glycol phenyl ethers





Dipropylene glycol phenyl ethers



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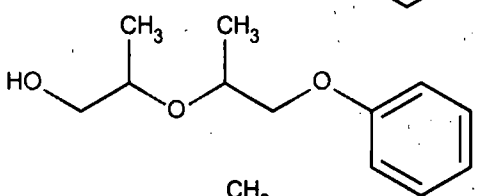

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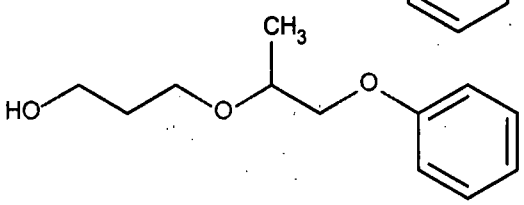

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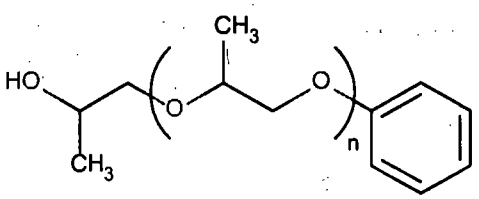
Polypropylene glycol phenyl ethers



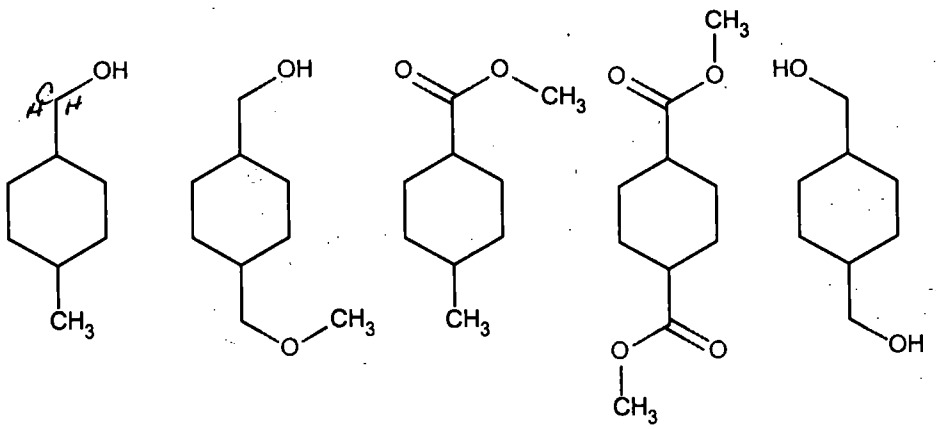
Identity of Commercial Products in the Storage Tank based on information provided in MSDS Sheets

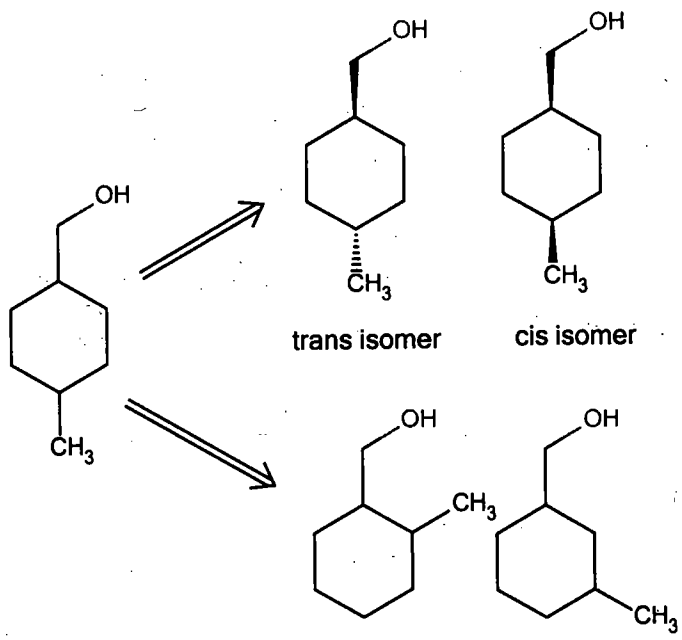
Prepared by Eric Weber (ORD/NERL/ERD)

Commercial Product	Component Chemicals	Component Chemical Distribution	CAS #	Log Kow (25°C)[a]	Water Solubility (mg/L, 25°C)[a]
Crude MCHM	4-methylcyclohexane methyl	68 to 89%	100-49-2 (34885-03-5)[b]	2.55	2,024
	4-(methoxymethyl)cyclohexanemethanol	4-22%	98955-27-2	1.78	6,804
	methyl 4-methylcyclohexanecarboxylate	5%	51181-40-9	3.06	173
	dimethyl 1,4-cyclohexanedicarboxylate	1%	94-60-0	2.11	4,779
	methanol	1%	67-56-1	2.96	1,000,000
	1,4-cyclohexanedimethanol	1-2%	105-08-8	1.49	4312
DOWANOL™ PPh Glycol Ether	1-phenoxy-2-propanol	major	770-35-4	1.52	1,013
	2-phenoxy-1-propanol	minor	4217-66-7	1.52	1,214
	Dipropylene glycol phenyl ether (DiPPH)	7%	See data below for individual components of DIPPH		
DOWANOL™ DIPPH Glycol Ether	3-[(1-phenoxy-2-propanyl)oxy]-1-propanol	>60%	51730-94-0	1.73	4,137
	propylene glycol phenyl ether	<25%	See data above for DOWANOL PPh Glycol Ether		
	polypropylene glycol phenyl ether	<15%	28212-40-0	NA	NA

[a]Calculated using EPI SUITE™; [b]Eastman MSDS for CrudeMCHM

Crude MCHM





Ex. 5 - Deliberative

Warner, Sue

From: Curry, John
Sent: Monday, February 03, 2014 3:13 PM
To: Gundersen, Jennifer; Zawodny, Peggy; Graybill, Eric; Molnar, Adam; Warner, Sue
Cc: Caporale, Cynthia; Wilding, Stevie
Subject: Sample Assignment Memo for: West Virginia Chemical Leak; DAS R34313; WO#1401010

Sample Assignment Memo for: West Virginia Chemical Leak; DAS R34313; WO#1401010

Parameter(s)	Matrix	Number of Samples	pH	Analyst	Location
VOCs (GC/MS Identification Scan)	AQ/Waste	3*	-	PZ/SW	G206/F201
Alcohols by EPA 8015D	AQ/Waste	3*	-	AM	G206/F201
GC/MS Identification Scan	AQ/Waste	3*	-	ERG	G206/F201
HPLC Identification Scan	AQ/Waste	3*	-	JG	G206/F201
*Same container					

Temperature Blank: NO TEMP BLANK

Due Date: Unvalidated: 2/13/2014 Final: 02/20/2014

Comments:

Warner, Sue

From: Caporale, Cynthia
Sent: Thursday, February 06, 2014 3:57 PM
To: R3 ESC-LB; Slayton, Joe
Cc: Foreman, Fred
Subject: WV Spill - 9 am Conf Call on Degradation Products

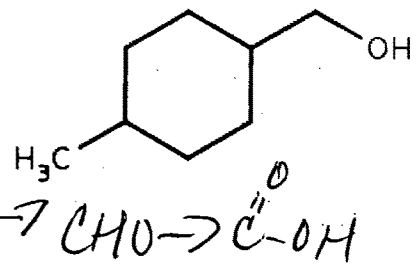
For those that are interested I will have the 9am WV Spill Response call in E201 tomorrow (Friday 2/7). A topic to be discussed tomorrow is the issue of potential degradation products from MCHM and PPH based on today's email that I sent.

Cynthia Caporale, Chief
OASQA Laboratory Branch
U.S. EPA Region III
Environmental Science Center
Fort Meade, MD
(410) 305-2732
Fax: (410) 305-3095

Ex. 5 - Deliberative

4-Methylcyclohexanemethanol

CASRN: 34885-03-5



Ex. 5 - Deliberative

4-Methylcyclohexanemethanol (MCHM) is the major component of crude MCHM. Crude MCHM is a mixture of various compounds. This record contains information on the title compound, 4-Methylcyclohexanemethanol, unless otherwise noted at the end of an excerpt (Example: /Crude 4-Methylcyclohexanemethanol/). This record contains data available at the time the record was created. The record will be updated with additional information as it becomes available.

Ex. 5 - Deliberative

For more information, search the NLM HSDB database.

Human Health Effects:

Skin, Eye and Respiratory Irritations:
A strong skin irritant
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014 http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

A moderate eye irritant
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014 http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

Probable Routes of Human Exposure:
Occupational exposure to 4-methylcyclohexanemethanol may occur through inhalation and dermal contact with this compound at workplaces where 4-methylcyclohexanemethanol is produced or used. Populations in the vicinity of a spill site may be exposed to 4-methylcyclohexanemethanol via ingestion of and dermal contact with contaminated water. (SRC)
PEER REVIEWED

Emergency Medical Treatment:

Antidote and Emergency Treatment:
/SRP:/ Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on the left side (head-down

position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Poisons A and B/
[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 160] **PEER REVIEWED**

/SRP:/ Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if needed. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary ... . Monitor for shock and treat if necessary ... . Anticipate seizures and treat if necessary ... . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport ... . Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool ... . Cover skin burns with dry, sterile dressings after decontamination ... . /Poisons A and B/
[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 160] **PEER REVIEWED**

/SRP:/ Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. Positive-pressure ventilation techniques with a bag valve mask device may be beneficial. Consider drug therapy for pulmonary edema ... . Consider administering a beta agonist such as albuterol for severe bronchospasm ... . Monitor cardiac rhythm and treat arrhythmias as necessary ... . Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) or lactated Ringer's if signs of hypovolemia are present. For hypotension with signs of hypovolemia, administer fluid cautiously. Watch for signs of fluid overload ... . Treat seizures with diazepam or lorazepam ... . Use proparacaine hydrochloride to assist eye irrigation ... . /Poisons A and B/
[Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3Rd edition, Elsevier Mosby, St. Louis, MO 2005, p. 160-1] **PEER REVIEWED**

Animal Toxicity Studies:

Non-Human Toxicity Excerpts:
/LABORATORY ANIMALS: Acute Exposure/ Rabbit eye irritation. The test article was a moderate eye irritant.
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Acute Exposure/ Groups of two male and two female rats (CD (SD) BR) were given doses of 200, 400, or 800 mg/kg/day of 4-methylcyclohexane methanol in corn oil for five days as part of a probe study conducted to establish dose levels for the four-week toxicity study. Rats dosed with 800 mg/kg showed signs of /CNS depression/ resulting in decreased activity levels (one male and two females) and ataxia (one female). One of the female rats was subsequently euthanized. One of the 400 mg/kg/day females had decreased activity on days 2 and 3 of the study. The remaining animals did not exhibit clinical abnormalities related to exposure to the test article.
[Eastman Kodak Company; Four-week oral toxicity study of 4-methylcyclohexane methanol in the rat. p. 10 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Acute Exposure/ A single dose of 500 mg/kg of the neat test substance /crude 4-methylcyclohexanemethanol/ was administered by gavage to female /Sprague-Dawley/ rats. Abnormal clinical signs were limited to transient reduced activity for all rats and transient stumbling for two rats on the day of dosing. No other abnormal clinical signs were noted at any time during the 14-day observation period. No mortality was observed, and all animals gained weight. No treatment-related changes were observed at necroscopy, and no tissues were collected for histological examination. A single oral dose of 500 mg/kg /of/ the test substance did not cause hematuria in female rats of this strain. /Crude 4-methylcyclohexanemethanol/
[Eastman Kodak Company; Crude MCHM Acute oral toxicity study in the rat (Final report) p. 6 (1999). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Acute Exposure/ An acute dermal toxicity study was conducted in male and female rats /Sprague-Dawley/ administered a single limit dose of 2000 mg/kg of the test substance /crude 4-methylcyclohexanemethanol/ topically. The test substance, a clear and colorless liquid, was administered neat. One female /rat/ was found dead the day after test substance application (day 1) and a second female rat was found dead on day 3. For male rats, clinical signs observed during the 14-day observation period were limited to erythema (days 1 to 4) and desquamation (days 5 to 14) of the skin at the site of application ... . For female rats,

transient weakness (moderate to severe) was noted on the day following test substance application (day 1). Prostration was noted on day 2 for a single female rat which subsequently died. Stumbling, which was observed for four female rats on the day following test substance application, was either transient or observed prior to death. For female rats, abnormalities of the skin at the site of application were observed from day 1 through study termination; erythema was observed an days 1 and 2, desquamation was observed on days 6 to 14, and induration was observed on days 2 to 14. Additionally, lack of feces was observed on day 2 and inguinal hair wet with urine was observed on days 1 to 3 for the female rats. Red urine was noted for four female rats on days 1, 2, or 3, therefore, the urine from all animals was tested for the presence of blood using a semi-quantitative dipstick (N-Multistix). The urine from rats with red discolored urine produced a positive response with the N-Multistix for most of the rats on day 1 and approximately half of the rats on day 3. A positive N-Multistix result for animals which did not have red discolored urine was considered indicative of levels of blood in the urine too low to produce visible color changes. All animals which survived to scheduled necropsy gained weight during both weeks of the study. The cause of death for rats which died after treatment with the test substance was not determined. Treatment-related gross or microscopic changes were observed only for female rats. For the two female rats which died, treatment-related gross lesions included distention of the urinary bladder with red urine, and/or hemorrhage in the glandular gastric mucosa. The lesions observed in the glandular gastric mucosa may have been due to consumption of test substance during grooming or may have been due to stress. Darker than normal spleens were observed for the two female rats which had red urine and also died. Microscopic lesions consisted of atrophy and congestion of the splenic red pulp and/or atrophy and necrosis of the splenic white pulp. The white pulp atrophy may have been secondary to stress and the red pulp atrophy and congestion may have been related to stress and/or hemorrhage. However, splenic effects following dermal application and wrapping are uncommon observations in this laboratory. In addition, splenic effects have not been associated with wrapping... Therefore, the splenic effects may be associated with test substance toxicity. Treatment-related lesions observed for one of the female rats that survived the 14-day observation period consisted of desquamation and minor induration of the skin at the application site grossly and consisted of focal necrosis and eschar formation on the skin at the application site microscopically. The test substance was a dermal irritant as evidenced by focal necrosis and eschar formation on the skin at the application site... /Crude 4-methylcyclohexanemethanol/
[Eastman Kodak Company; Crude MCHM Acute dermal toxicity study in the rat (Final report) p. 6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Acute Exposure/ Dermal irritation in guinea pigs (24 hr occluded single dose) The test article was a strong skin irritant.
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Acute Exposure/ Skin sensitization study in guinea pigs. ... No reaction was observed at challenge in any of the animals previously induced with Freund's adjuvant or the test article /4-methylcyclohexane methanol/ in Freund's adjuvant.
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Acute Exposure/ An acute oral toxicity study was conducted in which three groups of five male and five female rats /Sprague-Dawley/ were administered 2000, 1000, or 500 mg/kg of the neat test substance /crude 4-methylcyclohexanemethanol/ by gavage. All animals assigned to the 2000 mg/kg dose groups and three male and four female rats assigned the 1000 mg/kg dose group died within 24 hr of dosing. In addition, one 500 mg/kg female rat was euthanized in extremis on day 2. Clinical signs observed during the 14-day observation period included slight to severe weakness, prostration, stumbling, a reduced amount or lack of feces, inguinal haircoat wet with urine, red urine, dehydration, gasping, and red staining of hair of face, hair of /front legs/, and skin of front paws. Severe weakness and prostration were noted only in animals assigned to the 1000 or 2000 mg/kg dose groups which subsequently died. Transient slight weakness was observed for all 500 mg/kg animals and transient moderate weakness was observed for the surviving 1000 mg/kg animals on the day of dosing (day 0). Stumbling, which was observed for animals from all dose groups on the day of dosing, was either transient or observed prior to death. All surviving male rats appeared clinically normal by day 2 and all surviving female rats appeared clinically normal by day 4. Since red urine was noted for some animals, urine was tested for the presence of blood using a semi-quantitative dipstick (N-Multistix). The urine from all rats with red discolored urine, produced a positive response with the N-Multistix. The urine from approximately half of the rats which did not have red urine produced a positive response with the N-Multistix. A positive N-Multistix response in the absence of red discolored urine was considered indicative of levels of blood in the urine too low to produce visible color changes. All animals which survived to scheduled necropsy gained weight during both weeks of the study. The test substance was a gastric irritant as evidenced by edema of the glandular gastric mucosa for one 1000 mg/kg rat which died on day 1. In addition, red discoloration of the urine in the urinary bladder observed for four 1000 mg/kg rats which died on day 1 was considered treatment-related, although the source of discoloration was

not determined. No other treatment-related changes were detected for the other 1000 mg/kg or for any 500 or 2000 mg/kg rats during the necropsy examinations and no treatment-related changes were observed during the histopathology examinations. /Crude 4-methylcyclohexanemethanol/
[Eastman Kodak Company; Crude MCHM Acute oral toxicity study in the rat (Final Report) p. 6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ Dose levels of 0, 25, 100, and 400 mg/kg/day were chosen for the four week study ... . In the four-week study, the test article was administered five days per week by gavage in corn oil to groups of five male and five female rats /(CD (SD) BR) from Charles River Laboratories/. No mortality was observed during this study. Minimal reductions in body weight growth were present for both male and female rats given the high-dose of the test article. These differences were not statistically significant. At lower dose levels, no consistent effect was noted. Males given the lower doses weighed slightly less than their control group while females weighed slightly more. Feed consumption was unaffected by administration of the test material. Sialorrhea after dose administration occurred frequently in the 400 mg/kg male and female dose groups from days 14 to 28. Transient depression of activity occurred in one 400 mg/kg female animal on day 3 of the study. These were the only two treatment-related clinical observations noted. Hematologic changes indicative of minimal anemia were observed in the 400 mg/kg female group. These changes included a significantly decreased mean red blood cell count relative to control group, and lower mean values for hemoglobin and hematocrit. In the absence of evidence of increased red blood cell destruction or turnover, these results suggest an interference with erythropoiesis rather than a direct effect on circulating red blood cells. Male and female rats from the 400 mg/kg dose group had significant increases in mean serum creatinine levels relative to their respective control groups, although the differences were not clearly of biological significance as urea nitrogen levels were not similarly increased. Microscopic examination of the kidneys of the 400 mg/kg animals revealed scattered areas of degeneration of the proximal convoluted tubules in 2 out of 5 animals of each sex. While mean relative kidney weights of all male treatment groups were statistically significantly heavier than their control group, the difference did not fit a dose-related pattern. Male rats from the 400 mg/kg dose group had significantly higher mean serum aspartate transaminase (AST) and sorbitol dehydrogenase (SDH) levels when compared to their control group. While the high-dose female group did not exhibit similar increases, one of the high-dose females did have a elevated SDH level and the mean relative liver weight for the female high-dose group was statistically significantly increased at the 400 mg/kg dose level. Microscopic examination of the livers from 400 mg/kg animals of both sexes revealed increased severity and wider distribution of chronic focal inflammation in three males and two females when they were compared to their control group. In summary, administration of 400 mg/kg/day of the test article for four weeks was associated with erythropoletic, kidney, and liver effects. None of these effects were indicative of more than minor toxicity, and all were most likely reversible. The no-observed-effect level for this subacute toxicity study was 100 mg/kg/day.
[Eastman Kodak Company; Four-week oral toxicity study of 4-methylcyclohexane methanol in the rat. p. 10 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ Repeated skin irritation in guinea pigs /nine daily applications over a period of eleven days/. There was exacerbation of the irritant response with repeated application of the test material.
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/LABORATORY ANIMALS: Subchronic or Prechronic Exposure/ Groups of five male and five female Sprague-Dawley rats were treated topically with 2000, 500, 100, or 0 mg/kg of test substance /crude 4-methylcyclohexanemethanol/ 6 hours per day for 13 consecutive weekdays. The test substance, a clear liquid, was administered as received under a semi-occlusive wrap. Elizabethan collars were placed around each animal's neck immediately after removal of the test substance and the associated wrapping material. The collars were removed the following morning. No mortality was observed. Animals were observed daily for clinical signs of toxicity. Test substance-related clinical abnormalities were limited to erythema, desquamation, and crust/scale formation at the test substance application site with minimal to moderate severities for the high-dose group and minimal to minor severities for the mid- and low-dose groups. Body weights and feed consumption were measured at least weekly. Mean body weights and mean feed consumption were comparable among the groups. On day 13, all animals were placed in metabolism cages for the collection of urine. No blood was detected in the urine, and urine sediment was unremarkable. At study termination, animals were anesthetized with carbon dioxide, and blood was obtained from the posterior vena cava for clinical chemistry and hematology analyses. Fasted body weight and liver, kidney and spleen weights were measured at necropsy. The mean serum phosphorus level was lower ($p \leq 0.05$) for the high-dose male group, and the mean serum triglyceride level was higher ($p \leq 0.05$) for the high-dose female group when compared with the control group. There were no other differences in hematology or clinical chemistry parameters between treated and control groups. Mean relative (to body weight) liver weights were elevated ($p \leq 0.05$) for the high-dose female group when compared with the control group. The mean terminal body weights

and all other organ weights for male and female rats were comparable among the groups. The liver, kidney, spleen, sternum (with bone marrow), and gross lesions were collected in 10% formalin. All tissues collected, except gross lesions of the skin, from the high-dose and control groups were examined microscopically. In addition, all gross lesions, except skin, were examined microscopically for the mid- and low-dose groups. Test substance-related lesions observed at the time of necropsy were limited to erythema and desquamation of the skin at the application site for the high-dose group and desquamation of the skin at the application site for the mid- and low-dose groups. All other lesions were considered incidental to exposure to the test substance. No treatment-related microscopic changes were observed. Based on dermal irritation observed at all treatment levels, a no-observed-effect level (NOEL) was not determined. However, based on the absence of significant histopathologic and serum clinical chemistry changes, 2000 mg/kg was considered to be the no-observed-adverse-effect level (NOAEL) for systemic toxicity /Crude 4-methylcyclohexanemethanol/
[Eastman Kodak Company; Crude MCHM A two-week dermal toxicity study in the rat (Final Report). p. 7 (1999). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

/GENOTOXICITY/ The tester strains used in the mutagenicity study were Salmonella typhimurium tester stains TA98, TA100, TA1535, TA1537, and Escherichia coli tester strain WP2uvrA(pKM101). The assay was conducted with six doses of test article /crude 4-methylcyclohexanemethanol/ in both the presence and absence of S9 mix with concurrent vehicle and positive controls using three plates per dose. The doses tested were 5000, 2500, 1000, 500, 250, and 100 ug per plate in both the presence and absence of S9 mix. The results of the initial mutagenicity assay were confirmed in an independent experiment. The results of the Salmonella-Escherichia coli/Mammalian-Microsome Reverse Mutation Assay with a Confirmatory Assay indicate that under the conditions of this study, /the/ test article did not cause a positive increase in the number of revertants per plate of any of the tester strains either in the presence or absence of microsomal enzymes prepared from Aroclor-induced rat liver (S9). /Crude 4-methylcyclohexanemethanol/
[Covance Laboratories, Inc.; Mutagenicity test with EC 97-0216, Crude MCHM in the Salmonella-Escherichia coli/Mammalian microsome reverse mutation assay with a confirmatory assay (Final Report) p. 6 (1997). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

Non-Human Toxicity Values:

LD50 Rats dermal 3.6 mL/kg
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

LD50 Rats female oral 884 mg/kg
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

LD50 Rats male oral 1768 mg/kg
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

LD50 Rats dermal >2000 mg/kg
[Eastman Kodak Company; Crude MCHM Acute dermal toxicity study in the rat (Final report) p. 6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

LD50 Rats male oral 933 mg/kg
[Eastman Kodak Company; Crude MCHM Acute oral toxicity study in the rat (Final Report) p. 6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

LD50 Rats female oral 707 mg/kg
[Eastman Kodak Company; Crude MCHM Acute oral toxicity study in the rat (Final Report) p. 6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

LD50 Rats combined sexes oral 825 mg/kg
[Eastman Kodak Company; Crude MCHM Acute oral toxicity study in the rat (Final Report) p. 6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

Ecotoxicity Values:
LC50; Species: /Pimephales promelas/ (Fathead minnow); Conditions: freshwater, static; Concentration: 54.7 mg/L for 96 hr
[Eastman Kodak; Crude MCHM An acute aquatic effects test with Fathead minnow, Pimephales prolmelas (Final Report) p.6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

EC50; Species: Daphnia magna /(Water flea)/; Conditions: freshwater, static; Concentration: 98.1 mg/L for 48 hr
[Eastman Kodak; Crude MCHM An acute aquatic effects test with the Daphnid, Daphnia magna (Final Report) p.6 (1998). Available from, as of January 17, 2014: http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

Metabolism/Pharmacokinetics:

Pharmacology:

Environmental Fate & Exposure:

Environmental Fate/Exposure Summary:
4-Methylcyclohexanemethanol's production and use as a frother agent, reagent, and as a byproduct in the production of dimethyl hexahydroterephthalate may result in its release to the environment through various waste streams. If released to air, an estimated vapor pressure of 5.8X10-2 mm Hg at 25 deg C indicates 4-methylcyclohexanemethanol will exist solely as a vapor in the atmosphere. Vapor-phase 4-methylcyclohexanemethanol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 1 day. 4-Methylcyclohexanemethanol does not contain chromophores that absorb at wavelengths >290 nm and, therefore, is not expected to be susceptible to direct photolysis by sunlight. If released to soil, 4-methylcyclohexanemethanol is expected to have very high mobility based upon an estimated Koc of 34. Volatilization from moist soil surfaces is expected to be an important fate process based upon an estimated Henry's Law constant of 6.4X10-6 atm-cu m/mole. 4-Methylcyclohexanemethanol is not expected to volatilize from dry soil surfaces based upon its vapor pressure. Utilizing the modified Sturm test, 53% biodegradation was obtained in 4 weeks indicating that biodegradation is not an important environmental fate process in soil or water. If released into water, 4-methylcyclohexanemethanol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is expected to be an important fate process based upon this compound's estimated Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 7 days and 51 days, respectively. An estimated BCF of 22 suggests the potential for bioconcentration in aquatic organisms is low. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions (pH 5 to 9). Occupational exposure to 4-methylcyclohexanemethanol may occur through inhalation and dermal contact with this compound at workplaces where 4-methylcyclohexanemethanol is produced or used. Populations in the vicinity of a spill site may be exposed to 4-methylcyclohexanemethanol via ingestion of and dermal contact with contaminated water. (SRC)
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Probable Routes of Human Exposure:
Occupational exposure to 4-methylcyclohexanemethanol may occur through inhalation and dermal contact with this compound at workplaces where 4-methylcyclohexanemethanol is produced or used. Populations in the vicinity of a spill site may be exposed to 4-methylcyclohexanemethanol via ingestion of and dermal contact with contaminated water. (SRC)
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Artificial Pollution Sources:
4-Methylcyclohexanemethanol's production and use as a mineral frother(1), reagent(2), and as a byproduct in the production of dimethyl hexahydroterephthalate(3) may result in its release to the environment through various waste streams(SRC).
[(1) US EPA; Non-Confidential 2006 Inventory Update Reporting. National Chemical Information. Cyclohexanemethanol, 4-methyl- (34885-03-5). Available from, as of Jan 10, 2014:

http //cfpub epa gov/iursearch/index cfm (2) Reagent [CIT TCI Europe N V , Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5) Product Code M1412 Revision Number· 5, Revision Date 12/27/2013. Available from, as of Jan 13, 2014 http //www tcichemicals com/en/eu/ (3) Werle P et al, Alcohols, Polyhydric Ullmann's Encyclopedia of Industrial Chemistry 7th ed (1999-2014) New York, NY John Wiley & Sons Online Posting Date 15 Jul 2008]] **PEER REVIEWED**

Environmental Fate:

TERRESTRIAL FATE· Based on a classification scheme(1), an estimated Koc value of 34(SRC), determined from a structure estimation method(2), indicates that 4-methylcyclohexanemethanol is expected to have very high mobility in soil(SRC). Volatilization of 4-methylcyclohexanemethanol from moist soil surfaces is expected to be an important fate process(SRC) given an estimated Henry's Law constant of 6.4X10-6 atm-cu m/mole(SRC), using a fragment constant estimation method(3). 4-Methylcyclohexanemethanol is not expected to volatilize from dry soil surfaces(SRC) based upon an estimated vapor pressure of 5.8X10-2 mm Hg at 25 deg C(SRC), determined from a fragment constant method(2) Biodegradation data in soil were not available(SRC, 2014). Utilizing the modified Sturm test, 53% biodegradation was obtained in 4 weeks(4) indicating that biodegradation is not an important environmental fate process in soil(SRC).
[(1) Swann RL et al, Res Rev 85 17-28 (1983) (2) US EPA, Estimation Program Interface (EPI) Suite Ver 4 1 Nov, 2012 Available from, as of Jan 10, 2014
http //www epa gov/oppt/exposure/pubs/episuitedl htm (3) Meylan WM, Howard PH, Environ Toxicol Chem 10. 1283-93 (1991) (4) Eastman, Eastman Crude MCHM Studies Available from, as of Jan 16, 2014 http //www eastman com/Pages/Eastman-Crude-MCHM-Studies aspx **PEER REVIEWED**

AQUATIC FATE. Based on a classification scheme(1), an estimated Koc value of 34(SRC), determined from a structure estimation method(2), indicates that 4-methylcyclohexanemethanol is not expected to adsorb to suspended solids and sediment(SRC). Volatilization from water surfaces is expected(3) based upon an estimated Henry's Law constant of 6.4X10-6 atm-cu m/mole(SRC), developed using a fragment constant estimation method (4) Using this Henry's Law constant and an estimation method(3), volatilization half-lives for a model river and model lake are 7 and 51 days, respectively(SRC) According to a classification scheme(5), an estimated BCF of 22 (SRC), from an estimated log Kow of 2.55(2) and a regression-derived equation(2), suggests the potential for bioconcentration in aquatic organisms is low(SRC). Utilizing the modified Sturm test, 53% biodegradation was obtained in 4 weeks(6) indicating that biodegradation is not an important environmental fate process in water (SRC).
[(1) Swann RL et al, Res Rev 85· 17-28 (1983) (2) US EPA, Estimation Program Interface (EPI) Suite Ver 4 1 Nov, 2012 Available from, as of Jan 10, 2014
http //www epa gov/oppt/exposure/pubs/episuitedl htm (3) Lyman WJ et al, Handbook of Chemical Property Estimation Methods Washington, DC Amer Chem Soc pp 15-1 to 15-29 (1990) (4) Meylan WM, Howard PH, Environ Toxicol Chem 10 1283-93 (1991) (5) Franke C et al; Chemosphere 29 1501-14 (1994) (6) Eastman, Eastman Crude MCHM Studies Available from, as of Jan 16, 2014
http //www eastman com/Pages/Eastman-Crude-MCHM-Studies aspx **PEER REVIEWED**

ATMOSPHERIC FATE· According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), 4-methylcyclohexanemethanol, which has an estimated vapor pressure of 5 8X10-2 mm Hg at 25 deg C(SRC), determined from a fragment constant method(2), is expected to exist solely as a vapor in the ambient atmosphere Vapor-phase 4-methylcyclohexanemethanol is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals(SRC); the half-life for this reaction in air is estimated to be 1 day (SRC), calculated from its rate constant of 1.7X10-11 cu cm/molecule-sec at 25 deg C(SRC) that was derived using a structure estimation method(3). 4-Methylcyclohexanemethanol does not contain chromophores that absorb at wavelengths >290 nm(4) and, therefore, is not expected to be susceptible to direct photolysis by sunlight(SRC).
[(1) Bidleman TF, Environ Sci Technol 22 361-367 (1988) (2) US EPA, Estimation Program Interface (EPI) Suite Ver 4 1 Nov, 2012 Available from, as of Jan 10, 2014.
http //www epa gov/oppt/exposure/pubs/episuitedl htm (3) Meylan WM, Howard PH, Chemosphere 26 2293-99 (1993) (4) Lyman WJ et al, Handbook of Chemical Property Estimation Methods Washington, DC Amer Chem Soc pp 8-12 (1990)] **PEER REVIEWED**

Environmental Biodegradation:

AEROBIC· 4-Methylcyclohexanemethanol as crude material (contains a high amount of impurities including water), present at 20 mg DOC/L, showed 53% degradation in 4 weeks using an activated sludge inoculum in the OECD 301B (Ready Biodegradability test) using the CO2 Evolution Test (Modified Sturm). There was a lag phase of 9 days before biodegradation reached 10% and the test substance did not reach the 60% biodegradation within the first 10 days. Crude 4-methylcyclohexanemethanol exhibited inhibitory effects using 5- and 20-day BOD tests. Therefore, this compound is not expected to biodegrade rapidly(1).
[(1) Eastman, Eastman Crude MCHM Studies Available from, as of Jan 16, 2014
http //www eastman com/Pages/Eastman-Crude-MCHM-Studies aspx **PEER REVIEWED**

Environmental Abiotic Degradation:
The rate constant for the vapor-phase reaction of 4-methylcyclohexanemethanol with photochemically-produced hydroxyl radicals has been estimated as 1.7X10-11 cu cm/molecule-sec at 25 deg C(SRC) using a structure estimation method(1). This corresponds to an atmospheric half-life of about 1 day at an atmospheric concentration of 5X10+5 hydroxyl radicals per cu cm(1). 4-Methylcyclohexanemethanol is not expected to undergo hydrolysis in the environment due to the lack of functional groups that hydrolyze under environmental conditions(2). 4-Methylcyclohexanemethanol does not contain chromophores that absorb at wavelengths >290 nm(2) and, therefore, is not expected to be susceptible to direct photolysis by sunlight(SRC).
[(1) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm/ (2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 7-4, 7-5, 8-12 (1990)] **PEER REVIEWED**

Environmental Bioconcentration:
An estimated BCF of 22 was calculated in fish for 4-methylcyclohexanemethanol(SRC), using an estimated log Kow of 2.55(1) and a regression-derived equation(1). According to a classification scheme(2), this BCF suggests the potential for bioconcentration in aquatic organisms is low(SRC).
[(1) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm/ (2) Franke C et al; Chemosphere 29: 1501-14 (1994)] **PEER REVIEWED**

Soil Adsorption/Mobility:
Using a structure estimation method based on molecular connectivity indices(1), the Koc of 4-methylcyclohexanemethanol can be estimated to be 34(SRC). According to a classification scheme(2), this estimated Koc value suggests that 4-methylcyclohexanemethanol is expected to have very high mobility in soil.
[(1) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm (2) Swann RL et al; Res Rev 85: 17-28 (1983)] **PEER REVIEWED**

Volatilization from Water/Soil:
The Henry's Law constant for 4-methylcyclohexanemethanol is estimated as 6.4X10-6 atm-cu m/mole(SRC) using a fragment constant estimation method(1). This Henry's Law constant indicates that 4-methylcyclohexanemethanol is expected to volatilize from water surfaces(2). Based on this Henry's Law constant, the volatilization half-life from a model river (1 m deep, flowing 1 m/sec, wind velocity of 3 m/sec)(2) is estimated as 7 days(SRC). The volatilization half-life from a model lake (1 m deep, flowing 0.05 m/sec, wind velocity of 0.5 m/sec)(2) is estimated as 51 days(SRC). 4-Methylcyclohexanemethanol is not expected to volatilize from dry soil surfaces(SRC) based upon an estimated vapor pressure of 5.8X10-2 mm Hg(SRC), determined from a fragment constant method(3).
[(1) Meylan WM, Howard PH; Environ Toxicol Chem 10: 1283-93 (1991) (2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 15-1 to 15-29 (1990) (3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm **PEER REVIEWED**

Environmental Standards & Regulations:

Chemical/Physical Properties:

Molecular Formula:
C8-H16-O
[National Library of Medicine, SIS; ChemIDplus Lite Record for 4-Methylcyclohexanemethanol (CAS 34885-03-5). Available from, as of January 10, 2014: http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp **PEER REVIEWED**

Molecular Weight:
128.21
[Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC

Press, Inc. Boca Raton ,FL. 1994., p. V3: 2228] **PEER REVIEWED**

Color/Form:
Clear, colorless liquid
[TCI Europe; MSDS 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture). M1412. (34885-03-5). Available from as of Jan 10, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Odor:
Almost odorless
[TCI Europe; MSDS 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture). M1412. (34885-03-5). Available from as of Jan 10, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Density/Specific Gravity:
0.9074 g/cu cm at 20 deg C
[Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V3: 2228] **PEER REVIEWED**

Octanol/Water Partition Coefficient:
log Kow = 2.55 (est)
[US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm **PEER REVIEWED**

Solubilities:
In water, 2.024X10+3 mg/L at 25 deg C (est)
[US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm **PEER REVIEWED**

Vapor Pressure:
5.8X10-2 mm Hg at 25 deg C (est)
[US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm **PEER REVIEWED**

Other Chemical/Physical Properties:
BP: 75 deg C at 2.5 mm Hg
[Lide, D.R., G.W.A. Milne (eds.). Handbook of Data on Organic Compounds. Volume I. 3rd ed. CRC Press, Inc. Boca Raton ,FL. 1994., p. V3: 2228] **PEER REVIEWED**

Straw colored liquid; slight sweet organic odor. BP: > 10 deg C; Specific gravity: 0.9-0.92 at 16 deg C. Slightly soluble in water. Viscosity: 19 cPs at 22 deg C; 45 cPs at 0 deg C /Flottec FX140-04 Frother/
[Flottec; Flottec FX 140-04 Frother. Material Safety Data Sheet. March 2, 2013. Available from, as of Jan 14, 2014: http://www.flottec.com/Prd/Default.asp **PEER REVIEWED**

Henry's Law constant = 6.43X10-6 atm-cu m/mol at 25 deg C (est)
[US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm **PEER REVIEWED**

Hydroxyl radical reaction rate constant = 1.65X10-11 cu cm/molec-sec at 25 deg C (est)
[US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm **PEER REVIEWED**

Chemical Safety & Handling:

Skin, Eye and Respiratory Irritations:
A strong skin irritant
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014 http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

A moderate eye irritant
[Eastman Kodak Company; Acute toxicity of 4-methylcyclohexane methanol p. 13 (1990). Available from, as of January 17, 2014 http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx **PEER REVIEWED**

Flash Point:
112.8 deg C (Setaflash Closed Cup) /Crude 4-methylcyclohexanemethanol/
[Eastman Chemical Company; Safety Data Sheet for Crude MCHM. Product Identification Number EAN 972790. 18717-00, P1871700, P18717ET, P18717YZ. Revision Date 8/18/2011; Version 2.0. Available from, as of January 17, 2014:
http://ws.eastman.com/ProductCatalogApps/PageControllers/MSDSAll_PC.aspx?product=71014291 **PEER REVIEWED**

Fire Fighting Procedures:
When extinguishing fire, be sure to wear personal protective equipment.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Fire-extinguishing work is done from the windward and the suitable fire-extinguishing method according to the surrounding situation is used. Uninvolved persons should evacuate to a safe place. In case of fire in the surroundings: Remove movable containers if safe to do so.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Dry chemical, foam, water spray, carbon dioxide.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Toxic Combustion Products:
Carbon monoxide, Carbon dioxide
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Hazardous Reactivities & Incompatibilities:
Oxidizing agents
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Other Hazardous Reaction:
/Conditions to avoid/ Open flame
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Protective Equipment & Clothing:
Protective clothing. Protective boots, if the situation requires.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Safety glasses. A face-shield, if the situation requires.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Protective gloves.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Vapor respirator.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Use personal protective equipment. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Entry to non-involved personnel should be controlled around the leakage area by roping off...
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Preventive Measures:
Remove all sources of ignition. Fire-extinguishing devices should be prepared in case of a fire. Use sparkproof tools and explosion-proof equipment.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Install a closed system or local exhaust as possible so that workers should not be exposed directly. Also install safety shower and eye bath.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Use personal protective equipment. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Entry to non-involved personnel should be controlled around the leakage area by roping off...
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Avoid contact with skin, eyes and clothing.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent generation of vapour or mist. Keep away from flames and hot surfaces. Take measures to prevent the build up of electrostatic charge. Use explosion-proof equipment. Wash hands and face thoroughly after handling. Use a closed system, ventilation.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

SRP: The scientific literature for the use of contact lenses by industrial workers is inconsistent. The benefits or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact lenses should not be worn. In any event, the usual eye protection equipment should be worn even when contact lenses are in place.
PEER REVIEWED

SRP: Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. Ensure that the local ventilation moves the contaminant away from the worker.
PEER REVIEWED

Stability/Shelf Life:
Stable under proper conditions.

[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Storage Conditions:
Store away from incompatible materials such as oxidizing agents.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Keep container tightly closed. Store in a cool, dark and well-ventilated place.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Cleanup Methods:
Prevent product from entering drains.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Absorb spilled material in a suitable absorbent (e.g. rag, dry sand, earth, saw-dust). In case of large amount of spillage, contain a spill by bunding. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from, as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Disposal Methods:
SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal and plant life; and conformance with environmental and public health regulations.
PEER REVIEWED

SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.
PEER REVIEWED

Occupational Exposure Standards:

Manufacturing/Use Information:

Major Uses:
Industrial Function: flotation agent. /SRP: Used in the separation of usable coal from rocks, debris and cold dust./
[US EPA; Non-Confidential 2006 Inventory Update Reporting. National Chemical Information. Cyclohexanemethanol, 4-methyl- (34885-03-5). Available from, as of January 10, 2014: http://cfpub.epa.gov/iursearch/index.cfm **PEER REVIEWED**

Reagent
[TCI Europe N.V.; Safety Data Sheet for 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture) (34885-03-5). Product Code M1412. Revision Number: 5; Revision Date: 12/27/2013. Available from,

as of January 13, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Manufacturers:
Eastman Chemical Co, Inc; 200 South Wilcox Dr., Kingsport, TN 37660-5147
[US EPA; Chemical Data Reporting (CDR). Non-confidential 2012 Chemical Data Reporting information on chemical production and use in the United Sates. Available from, as of Jan 10, 2014: http://www.epa.gov/oppt/cdr/index.html **PEER REVIEWED**

TCI Europe N.V., Boerenveldseweg 6, Haven 1063, B-2070 Zwijndrecht, The Netherlands
[TCI Europe; MSDS 4-Methyl-1-cyclohexanemethanol (cis- and trans- mixture). M1412. (34885-03-5). Available from as of Jan 10, 2014: http://www.tcichemicals.com/en/eu/ **PEER REVIEWED**

Flottec, LLC, 338 West Maint St, Boonton, NJ 07005 /Formulator/
[Flottec; Flottec FX 140-04 Frother. Material Safety Data Sheet. March 2, 2013. Available from, as of Jan 14, 2014: http://www.flottec.com/Prd/Default.asp **PEER REVIEWED**

General Manufacturing Information:
/Byproduct in the production of/ dimethyl hexahydroterephthalate.
[Werle P et al; Alcohols, Polyhydric. Ullmann's Encyclopedia of Industrial Chemistry. 7th ed. (1999-2014). New York, NY: John Wiley & Sons. Online Posting Date: 15 Jul 2008] **PEER REVIEWED**

Formulations/Preparations:
Flottec FX-140-04 Frother /Mixture of 10-20 weight, % of 4-Methylcyclohexanemethanol with other alcohols/
[Flottec; Material Safety Data Sheet for Flottec FX-140-04 Frother, March 2, 2012; Available from, as of January 13, 2014 http://www.flottec.com/Prd/Default.asp **PEER REVIEWED**

Crude MCHM (68-89% 4-methylcyclohexanemethanol; 4-22% 4-(methoxymethyl)cyclohexanemethanol; 4-10% water; 5% methyl 4-methylcyclohexanecarboxylate; 1% dimethyl 1,4-cyclohexanedicarboxylate; 1% methanol; 1-2% 1,4-cyclohexanedimethanol).
[Eastman Chemical Company; Safety Data Sheet for Crude MCHM. Product Identification Number EAN 972790. 18717-00, P1871700, P18717ET, P18717YZ. Revision Date 8/18/2011; Version 2.0. Available from, as of January 17, 2014:
http://ws.eastman.com/ProductCatalogApps/PageControllers/MSDSAll_PC.aspx?product=71014291 **PEER REVIEWED**

U. S. Production:
Production volumes for non-confidential chemicals reported under the Inventory Update Rule.

Year	Production Range (pounds)
1986	No Reports
1990	No Reports
1994	No Reports
1998	No Reports
2002	>1 million - 10 million

[US EPA; Chemical Data Reporting. Non-confidential IUR Production Volume Information Submitted by Companies for Chemicals Under the 1986-2002 Inventory Update Rule (IUR). Cyclohexanemethanol, 4-methyl- (34885-03-5). Available from, as of January 10, 2014: http://epa.gov/cdr/tools/data/2002-vol.html **PEER REVIEWED**

Production volume for non-confidential chemicals reported under the 2006 Inventory Update Rule. Chemical: Cyclohexanemethanol, 4-methyl-. Aggregated National Production Volume: 1 to < 10 million pounds.
[US EPA; Non-Confidential 2006 Inventory Update Reporting. National Chemical Information. Cyclohexanemethanol, 4-methyl- (34885-03-5). Available from, as of January 10, 2014: http://cfpub.epa.gov/iursearch/index.cfm **PEER REVIEWED**

Non-confidential 2012 Chemical Data Reporting (CDR) information on the production and use of chemicals

manufactured or imported into the United States. Chemical: Cyclohexanemethanol, 4-methyl-. National Production Volume: Withheld.
[USEPA/Pollution Prevention and Toxics; 2012 Chemical Data Reporting Database. Cyclohexanemethanol, 4-methyl- (34885-03-5). Available from, as of January 13, 2014: http://java.epa.gov/oppt_chemical_search/ **PEER REVIEWED**

Laboratory Methods:

Special References:

Synonyms and Identifiers:

Related HSDB Records:
5364 [1,4-CYCLOHEXANEDIMETHANOL]

5284 [DIMETHYL HEXAHYDROTEREPHTHALATE]

Synonyms:
Hexahydro-p-methylbenzyl alcohol
PEER REVIEWED

4-Methylcyclohexylcarbinol
PEER REVIEWED

4-Methylcyclohexane methanol
PEER REVIEWED

MCHM
PEER REVIEWED

(4-Methylcyclohexyl)methanol
PEER REVIEWED

p-Methylcyclohexanemethanol
PEER REVIEWED

Associated Chemicals:
4-(methoxymethyl)cyclohexanedimethanol; 98955-27-2
Methyl 4-methylcyclohexanecarboxylate; 51181-40-9

Formulations/Preparations:
Flottec FX-140-04 Frother /Mixture of 10-20 weight, % of 4-Methylcyclohexanemethanol with other alcohols/
[Flottec; Material Safety Data Sheet for Flottec FX-140-04 Frother, March 2, 2012; Available from, as of January 13, 2014 http://www.flottec.com/Prd/Default.asp **PEER REVIEWED**

Crude MCHM (68-89% 4-methylcyclohexanemethanol; 4-22% 4-(methoxymethyl)cyclohexanemethanol; 4-10% water; 5% methyl 4-methylcyclohexanecarboxylate; 1% dimethyl 1,4-cyclohexanedicarboxylate; 1% methanol; 1-2% 1,4-cyclohexanedimethanol).
[Eastman Chemical Company; Safety Data Sheet for Crude MCHM. Product Identification Number EAN 972790. 18717-00, P1871700, P18717ET, P18717YZ. Revision Date 8/18/2011; Version 2.0. Available from, as of January 17, 2014: http://ws.eastman.com/ProductCatalogApps/PageControllers/MSDSAll_PC.aspx?product=71014291 **PEER REVIEWED**

Administrative Information:

Hazardous Substances Databank Number: 8182

Last Revision Date: 20140118

Last Review Date: Reviewed by SRP on 1/17/2014

Update History:
Field Update on 2014-01-29, 2 fields added/edited/deleted
Complete Update on 2014-01-18, 2 fields added/edited/deleted
Complete Update on 2014-01-17, 40 fields added/edited/deleted
Created 20140110

Ex. 5 - Deliberative

Warner, Sue

From: Caporale, Cynthia
Sent: Tuesday, February 11, 2014 8:21 AM
To: Poff, Kevin; Warner, Sue
Subject: FW: MCHM

Ex. 5 - Deliberative

More info from OPP on fate/exposure of MCHM. I'm hoping Thuy and Joseph Ferrario join us today on the call.

From: Nguyen, Thuy
Sent: Friday, February 07, 2014 2:29 PM
To: Caporale, Cynthia
Subject: FW: MCHM

Here are some Environmental Fate/Exposure data for MCHM.
It does not look like it will stay in water too long, and it has no known degradation pattern in the environment. See Joe's assessment below.
Thuy

From: Ferrario, Joseph
Sent: Friday, February 07, 2014 1:37 PM
To: Nguyen, Thuy
Cc: Ferrario, Joseph
Subject: MCHM

Ex. 5 - Deliberative

Hi Thuy, I just wanted to give you an update. Below is a bit of information I found on Toxnet. I highlighted the most pertinent information. I have found no data to support Ronald Ney's assertions. Cyclohexane is a part of the MCHM molecule but it is unlikely it would hydrolyze to cyclohexane or nitrophenol due to its lack of a reactive functional group. I have found nothing to support his statement that cyclohexane, cyclohexanol or cyclohexanone are pesticides.
I will continue to dig around and email you later. Take care, Joe

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http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+8182

Environmental Fate/Exposure Summary:

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4-Methylcyclohexanemethanol's production and use as a frother agent, reagent, and as a byproduct in the production of dimethyl hexahydroterephthalate may result in its release to the environment through various waste streams. If released to air, an estimated vapor pressure of 5.8X10-2 mm Hg at 25 deg C indicates 4-methylcyclohexanemethanol will exist solely as a vapor in the atmosphere. Vapor-phase 4-methylcyclohexanemethanol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 1 day. 4-Methylcyclohexanemethanol does not contain chromophores that absorb at wavelengths >290 nm and, therefore, is not expected to be susceptible to direct photolysis by sunlight. If released to soil, 4-methylcyclohexanemethanol is expected to have very high mobility based upon an estimated Koc of 34. Volatilization from moist soil surfaces is expected to be an important fate process based upon an estimated Henry's Law constant of 6.4X10-6 atm-cu m/mole. 4-Methylcyclohexanemethanol is not expected to volatilize from dry soil surfaces based upon its vapor pressure. Utilizing the modified Sturm test, 53% biodegradation was obtained in 4 weeks indicating that biodegradation is not an important environmental fate process in soil or water. If released into water, 4-methylcyclohexanemethanol is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is expected to be an important fate process based upon this compound's estimated Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 7 days and 51 days, respectively. An estimated BCF of 22 suggests the potential for bioconcentration in aquatic organisms is low. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions (pH 5 to 9). Occupational exposure to 4-methylcyclohexanemethanol may occur through inhalation and dermal contact with this compound at workplaces where 4-

Ex. 5 - Deliberative

methylcyclohexanemethanol is produced or used. Populations in the vicinity of a spill site may be exposed to 4-methylcyclohexanemethanol via ingestion of and dermal contact with contaminated water. (SRC)
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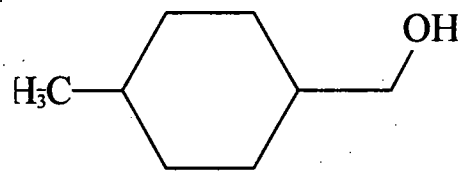
Ex. 5 - Deliberative

EPI Suite Results For CAS




```
SMILES : OCC1CCC(C)CC1
CHEM   :
MOL FOR: C8 H16 O1
MOL WT : 128.22
------------------------------ EPI SUMMARY (v4.00) --------------------------
Physical Property Inputs:
Log Kow (octanol-water):    ------
Boiling Point (deg C)  :    ------
Melting Point (deg C)  :    ------
Vapor Pressure (mm Hg) :    ------
Water Solubility (mg/L):    ------
Henry LC (atm-m3/mole) :    ------

Log Octanol-Water Partition Coef (SRC):
Log Kow (KOWWIN v1.68 estimate) =  2.55

Boiling Pt, Melting Pt, Vapor Pressure Estimations (MPBPVP v1.43):
Boiling Pt (deg C):  203.74   (Adapted Stein & Brown method)
Melting Pt (deg C):  -11.99   (Mean or Weighted MP)
VP(mm Hg,25 deg C):  0.0588   (Mean VP of Antoine & Grain methods)
VP (Pa, 25 deg C) :  7.84   (Mean VP of Antoine & Grain methods)

Water Solubility Estimate from Log Kow (WSKOW v1.42):
Water Solubility at 25 deg C (mg/L):  2024
log Kow used: 2.55 (estimated)
no-melting pt equation used

Water Sol Estimate from Fragments:
Wat Sol (v1.01 est) =  5244.8 mg/L

ECOSAR Class Program (ECOSAR v1.00):
Class(es) found:
Neutral Organics
```

Henrys Law Constant (25 deg C) [HENRYWIN v3.20]:
Bond Method : 8.63E-006 atm-m3/mole (8.74E-001 Pa-m3/mole)
Group Method: 6.43E-006 atm-m3/mole (6.52E-001 Pa-m3/mole)
For Henry LC Comparison Purposes:
User-Entered Henry LC: not entered
Henrys LC [via VP/WSol estimate using User-Entered or Estimated values]:
HLC: 4.901E-006 atm-m3/mole (4.966E-001 Pa-m3/mole)
VP: 0.0588 mm Hg (source: MPBPVP)
WS: 2.02E+003 mg/L (source: WSKOWWIN)

Log Octanol-Air Partition Coefficient (25 deg C) [KOAWIN v1.10]:
Log Kow used: 2.55 (KowWin est)
Log Kaw used: -3.452 (HenryWin est)
Log Koa (KOAWIN v1.10 estimate): 6.002
Log Koa (experimental database): None

Probability of Rapid Biodegradation (BIOWIN v4.10):
Biowin1 (Linear Model) : 0.8452
Biowin2 (Non-Linear Model) : 0.9094
Expert Survey Biodegradation Results:
Biowin3 (Ultimate Survey Model): 3.0758 (weeks)
Biowin4 (Primary Survey Model) : 3.7922 (days)
MITI Biodegradation Probability:
Biowin5 (MITI Linear Model) : 0.6455
Biowin6 (MITI Non-Linear Model): 0.7240
Anaerobic Biodegradation Probability:
Biowin7 (Anaerobic Linear Model): 0.5141
Ready Biodegradability Prediction: YES

Hydrocarbon Biodegradation (BioHCwin v1.01):
Structure incompatible with current estimation method!

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:
Vapor pressure (liquid/subcooled): 7.07 Pa (0.053 mm Hg)
Log Koa (Koawin est): 6.002
Kp (particle/gas partition coef. (m3/ug)):
Mackay model : 4.25E-007
Octanol/air (Koa) model: 2.47E-007
Fraction sorbed to airborne particulates (phi):
Junge-Pankow model : 1.53E-005
Mackay model : 3.4E-005
Octanol/air (Koa) model: 1.97E-005

Atmospheric Oxidation (25 deg C) [AopWin v1.92]:
Hydroxyl Radicals Reaction:
OVERALL OH Rate Constant = 16.5255 E-12 cm3/molecule-sec
Half-Life = 0.647 Days (12-hr day; 1.5E6 OH/cm3)
Half-Life = 7.767 Hrs
Ozone Reaction:
No Ozone Reaction Estimation
Fraction sorbed to airborne particulates (phi):
2.46E-005 (Junge-Pankow, Mackay avg)
1.97E-005 (Koa method)
Note: the sorbed fraction may be resistant to atmospheric oxidation

Soil Adsorption Coefficient (KOCWIN v2.00):
Koc : 34.42 L/kg (MCI method)

Ex. 5 - Deliberative

```
Log Koc:  1.537       (MCI method)
Koc    :  83.97  L/kg (Kow method)
Log Koc:  1.924       (Kow method)

Aqueous Base/Acid-Catalyzed Hydrolysis (25 deg C) [HYDROWIN v2.00]:
Rate constants can NOT be estimated for this structure!

Bioaccumulation Estimates (BCFBAF v3.01):
Log BCF from regression-based method = 1.347 (BCF = 22.23 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.4654 days (HL = 0.3424 days)
Log BCF Arnot-Gobas method (upper trophic) = 1.465 (BCF = 29.15)
Log BAF Arnot-Gobas method (upper trophic) = 1.465 (BAF = 29.15)
log Kow used: 2.55 (estimated)

Volatilization from Water:
Henry LC:  6.43E-006 atm-m3/mole  (estimated by Group SAR Method)
Half-Life from Model River:      104.3  hours   (4.344 days)
Half-Life from Model Lake :       1232  hours   (51.35 days)

Removal In Wastewater Treatment:
Total removal:                3.59  percent
Total biodegradation:         0.10  percent
Total sludge adsorption:      3.13  percent
Total to Air:                 0.36  percent
(using 10000 hr Bio P,A,S)

Removal In Wastewater Treatment:
Total removal:               93.11  percent
Total biodegradation:        92.00  percent
Total sludge adsorption:      1.05  percent
Total to Air:                 0.06  percent
(using Biowin/EPA draft method)

Level III Fugacity Model:
Mass Amount    Half-Life    Emissions
(percent)        (hr)       (kg/hr)
Air       1.59           15.5         1000
Water     32.5           360          1000
Soil      65.8           720          1000
Sediment  0.106          3.24e+003    0
Persistence Time: 408 hr


....
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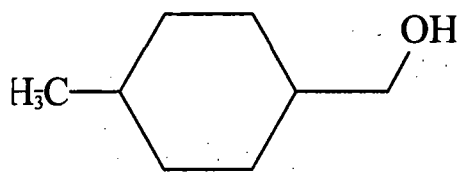
Ex. 5 - Deliberative

EPI Suite Results For CAS



SMILES : OCC1CCC(C)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

---------- EPI SUMMARY (v4.00) ----------

Physical Property Inputs:
Log Kow (octanol-water): ------
Boiling Point (deg C) : ------
Melting Point (deg C) : ------
Vapor Pressure (mm Hg) : ------
Water Solubility (mg/L): ------
Henry LC (atm-m3/mole) : ------

Log Octanol-Water Partition Coef (SRC):
Log Kow (KOWWIN v1.68 estimate) = 2.55

Boiling Pt, Melting Pt, Vapor Pressure Estimations (MPBPVP v1.43):
Boiling Pt (deg C): 203.74 (Adapted Stein & Brown method)
Melting Pt (deg C): -11.99 (Mean or Weighted MP)
VP(mm Hg,25 deg C): 0.0588 (Mean VP of Antoine & Grain methods)
VP (Pa, 25 deg C) : 7.84 (Mean VP of Antoine & Grain methods)

Water Solubility Estimate from Log Kow (WSKOW v1.42):
Water Solubility at 25 deg C (mg/L): 2024
log Kow used: 2.55 (estimated)
no-melting pt equation used

Water Sol Estimate from Fragments:
Wat Sol (v1.01 est) = 5244.8 mg/L

ECOSAR Class Program (ECOSAR v1.00):
Class(es) found:
Neutral Organics

```
Henrys Law Constant (25 deg C) [HENRYWIN v3.20]:
Bond Method :    8.63E-006  atm-m3/mole  (8.74E-001 Pa-m3/mole)
Group Method:    6.43E-006  atm-m3/mole  (6.52E-001 Pa-m3/mole)
For Henry LC Comparison Purposes:
User-Entered Henry LC:  not entered
Henrys LC [via VP/WSol estimate using User-Entered or Estimated values]:
HLC:  4.901E-006 atm-m3/mole  (4.966E-001 Pa-m3/mole)
VP:    0.0588 mm Hg (source: MPBPVP)
WS:    2.02E+003 mg/L (source: WSKOWWIN)

Log Octanol-Air Partition Coefficient (25 deg C) [KOAWIN v1.10]:
Log Kow used:  2.55  (KowWin est)
Log Kaw used:  -3.452  (HenryWin est)
Log Koa (KOAWIN v1.10 estimate):  6.002
Log Koa (experimental database):  None

Probability of Rapid Biodegradation (BIOWIN v4.10):
Biowin1 (Linear Model)          :    0.8452
Biowin2 (Non-Linear Model)      :    0.9094
Expert Survey Biodegradation Results:
Biowin3 (Ultimate Survey Model):    3.0758  (weeks       )
Biowin4 (Primary Survey Model) :    3.7922  (days        )
MITI Biodegradation Probability:
Biowin5 (MITI Linear Model)     :    0.6455
Biowin6 (MITI Non-Linear Model):    0.7240
Anaerobic Biodegradation Probability:
Biowin7 (Anaerobic Linear Model):  0.5141
Ready Biodegradability Prediction:   YES

Hydrocarbon Biodegradation (BioHCwin v1.01):
Structure incompatible with current estimation method!

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:
Vapor pressure (liquid/subcooled):  7.07 Pa (0.053 mm Hg)
Log Koa (Koawin est  ): 6.002
Kp (particle/gas partition coef. (m3/ug)):
Mackay model           :  4.25E-007
Octanol/air (Koa) model:  2.47E-007
Fraction sorbed to airborne particulates (phi):
Junge-Pankow model     :  1.53E-005
Mackay model           :  3.4E-005
Octanol/air (Koa) model:  1.97E-005

Atmospheric Oxidation (25 deg C) [AopWin v1.92]:
Hydroxyl Radicals Reaction:
OVERALL OH Rate Constant =  16.5255 E-12 cm3/molecule-sec
Half-Life =     0.647 Days (12-hr day; 1.5E6 OH/cm3)
Half-Life =     7.767 Hrs
Ozone Reaction:
No Ozone Reaction Estimation
Fraction sorbed to airborne particulates (phi):
2.46E-005 (Junge-Pankow, Mackay avg)
1.97E-005 (Koa method)
Note: the sorbed fraction may be resistant to atmospheric oxidation

Soil Adsorption Coefficient (KOCWIN v2.00):
Koc    :  34.42  L/kg (MCI method)
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Ex. 5 - Deliberative

```
Log Koc:  1.537       (MCI method)
Koc    :  83.97  L/kg (Kow method)
Log Koc:  1.924       (Kow method)

Aqueous Base/Acid-Catalyzed Hydrolysis (25 deg C) [HYDROWIN v2.00]:
Rate constants can NOT be estimated for this structure!

Bioaccumulation Estimates (BCFBAF v3.01):
Log BCF from regression-based method = 1.347 (BCF = 22.23 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.4654 days (HL = 0.3424 days)
Log BCF Arnot-Gobas method (upper trophic) = 1.465 (BCF = 29.15)
Log BAF Arnot-Gobas method (upper trophic) = 1.465 (BAF = 29.15)
log Kow used: 2.55 (estimated)

Volatilization from Water:
Henry LC:  6.43E-006 atm-m3/mole  (estimated by Group SAR Method)
Half-Life from Model River:      104.3  hours   (4.344 days)
Half-Life from Model Lake :       1232  hours   (51.35 days)

Removal In Wastewater Treatment:
Total removal:                3.59  percent
Total biodegradation:         0.10  percent
Total sludge adsorption:      3.13  percent
Total to Air:                 0.36  percent
(using 10000 hr Bio P,A,S)

Removal In Wastewater Treatment:
Total removal:               93.11  percent
Total biodegradation:        92.00  percent
Total sludge adsorption:      1.05  percent
Total to Air:                 0.06  percent
(using Biowin/EPA draft method)

Level III Fugacity Model:
Mass Amount    Half-Life    Emissions
(percent)        (hr)       (kg/hr)
Air       1.59           15.5         1000
Water     32.5           360          1000
Soil      65.8           720          1000
Sediment  0.106          3.24e+003    0
Persistence Time: 408 hr


....
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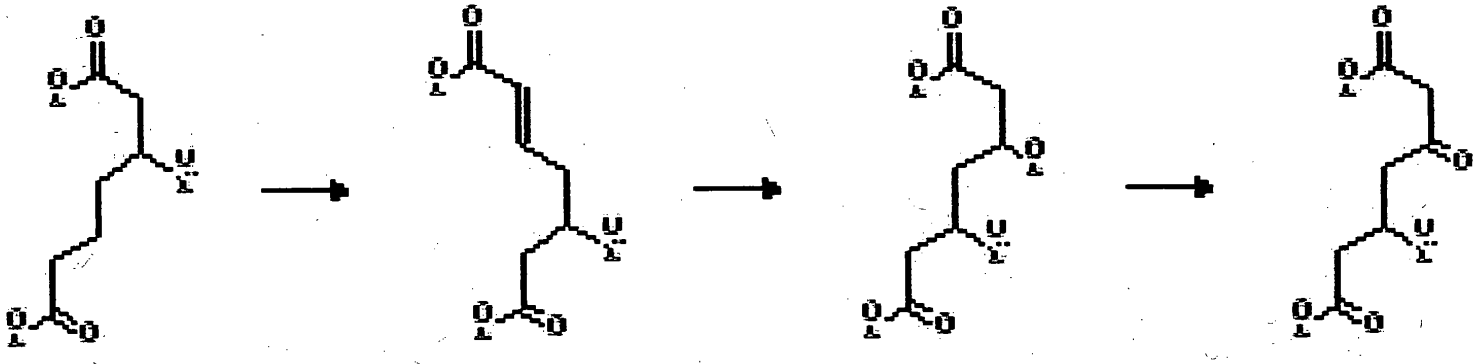


Warner, Sue

From: Poff, Kevin
Sent: Tuesday, February 11, 2014 11:27 AM
To: Magnuson, Matthew; Arguto, William; Gray, Wendy; Weber, Eric; Caporale, Cynthia; binetti, victoria; Hedrick, Elizabeth; Warner, Sue
Cc: Allgeier, Steve; R3 ESC-LB; Sayles, Gregory; Lindquist, Alan
Subject: RE: EPI Suite prediction for MCMH. RE: MCHM DEGREDATION DISCUSSION Call in Number
Attachments: Degradation ProductsMCHM.bmp; Degradation Products diPPH.bmp; diPPH (3).txt; MCHM (3).txt

In addition to the EPISuite data , I attached the QSAR modeling that was run on MCHM and diPPH using the EPIsuite and CATABOL interfaces. The degradation products show chemical structures and probabilities of that particular degradation pathway.

From: Magnuson, Matthew
Sent: Tuesday, February 11, 2014 10:30 AM
To: Arguto, William; Gray, Wendy; Weber, Eric; Caporale, Cynthia; binetti, victoria; Hedrick, Elizabeth; Warner, Sue
Cc: Allgeier, Steve; R3 ESC-LB; Sayles, Gregory; Lindquist, Alan
Subject: EPI Suite prediction for MCMH. RE: MCHM DEGREDATION DISCUSSION Call in Number

As discussed on the call, here is the printout of EPI Suite predictions for MCHM.

From: Arguto, William
Sent: Tuesday, February 11, 2014 6:57 AM
To: Gray, Wendy; Magnuson, Matthew; Weber, Eric; Caporale, Cynthia; binetti, victoria; Hedrick, Elizabeth; Warner, Sue
Cc: Allgeier, Steve; R3 ESC-LB
Subject: MCHM DEGREDATION DISCUSSION Call in Number
Importance: High

The call in number for the conference call is

Ex. 6 - Personal Privacy

Thanks
Bill

CAS Number: (null)
SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

---------- EPI SUMMARY (v4.00) ----------

Physical Property Inputs:
Log Kow (octanol-water): ------
Boiling Point (deg C) : ------
Melting Point (deg C) : ------
Vapor Pressure (mm Hg) : ------
Water Solubility (mg/L): ------
Henry LC (atm-m3/mole) : ------

KOWWIN Program (v1.67) Results:

Log Kow(version 1.67 estimate): 2.55

SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

TYPE	NUM	LOGKOW FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	-CH3 [aliphatic carbon]	0.5473	0.5473
Frag	5	-CH2- [aliphatic carbon]	0.4911	2.4555
Frag	2	-CH [aliphatic carbon]	0.3614	0.7228
Frag	1	-OH [hydroxy, aliphatic attach]	-1.4086	-1.4086
Const		Equation Constant		0.2290
			Log Kow =	2.5460

MPBPVP (v1.43) Program Results:

Experimental Database Structure Match: no data

SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

---------- SUMMARY MPBVP v1.43 ----------

Boiling Point: 203.74 deg C (Adapted Stein and Brown Method)

Melting Point: -29.28 deg C (Adapted Joback Method)
Melting Point: 5.30 deg C (Gold and Ogle Method)
Mean Melt Pt : -11.99 deg C (Joback; Gold,Ogle Methods)
Selected MP: -11.99 deg C (Mean Value)

Vapor Pressure Estimations (25 deg C):
(Using BP: 203.74 deg C (estimated))
(MP not used for liquids)
VP: 0.0647 mm Hg (Antoine Method)
: 8.63 Pa (Antoine Method)
VP: 0.053 mm Hg (Modified Grain Method)
: 7.06 Pa (Modified Grain Method)
VP: 0.448 mm Hg (Mackay Method)

: 59.7 Pa (Mackay Method)
Selected VP: 0.0588 mm Hg (Mean of Antoine & Grain methods)
: 7.84 Pa (Mean of Antoine & Grain methods)

TYPE	NUM	BOIL DESCRIPTION	COEFF	VALUE
Group	1	-CH3	21.98	21.98
Group	1	-CH2-	24.22	24.22
Group	4	-CH2- (ring)	26.44	105.76
Group	2	>CH- (ring)	21.66	43.32
Group	1	-OH (primary)	88.46	88.46
*		Equation Constant		198.18
RESULT-uncorr		BOILING POINT in deg Kelvin		481.92
RESULT- corr		BOILING POINT in deg Kelvin		476.90
		BOILING POINT in deg C		203.74

TYPE	NUM	MELT DESCRIPTION	COEFF	VALUE
Group	1	-CH3	-5.10	-5.10
Group	1	-CH2-	11.27	11.27
Group	4	-CH2- (ring)	7.75	31.00
Group	2	>CH- (ring)	19.88	39.76
Group	1	-OH (primary)	44.45	44.45
*		Equation Constant		122.50
RESULT		MELTING POINT in deg Kelvin		243.88
		MELTING POINT in deg C		-29.28

Water Sol from Kow (WSKOW v1.41) Results:

Water Sol: 2024 mg/L

SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

---------- WSKOW v1.41 Results ----------

Log Kow (estimated) : 2.55
Log Kow (experimental): not available from database
Log Kow used by Water solubility estimates: 2.55

Equation Used to Make Water Sol estimate:
Log S (mol/L) = 0.796 - 0.854 log Kow - 0.00728 MW + Correction
(used when Melting Point NOT available)

Correction(s):	Value
Alcohol, aliphatic	0.510

Log Water Solubility (in moles/L) : -1.802
Water Solubility at 25 deg C (mg/L): 2024

WATERNT Program (v1.01) Results:
==========

Water Sol (v1.01 est): 5244.8 mg/L

SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

TYPE	NUM	WATER SOLUBILITY FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	-CH3 [aliphatic carbon]	-0.3213	-0.3213
Frag	1	-CH2- [aliphatic carbon]	-0.5370	-0.5370
Frag	2	-CH [aliphatic carbon]	-0.5285	-1.0570
Frag	1	-OH [hydroxy, aliphatic attach]	1.6012	1.6012
Frag	4	-CH2- [aliphatic carbon, cyclic]	-0.3308	-1.3233
Const		Equation Constant		0.2492

Log Water Sol (moles/L) at 25 dec C = -1.3882
Water Solubility (mg/L) at 25 dec C = 5244.8

ECOSAR Program (v1.00) Results:
==========
SMILES : C1(C)CCC(CO)CC1
CHEM :
CAS Num:
ChemID1:
ChemID2:
ChemID3:
MOL FOR: C8 H16 O1
MOL WT : 128.22
Log Kow: 2.55 (KowWin estimate)
Melt Pt:
Wat Sol: 2024 mg/L (WskowWin estimate)

ECOSAR v1.00 Class(es) Found

Neutral Organics

ECOSAR Class	Organism	Duration	End Pt	Predicted mg/L (ppm)
Neutral Organics	: Fish	96-hr	LC50	32.690
Neutral Organics	: Fish	14-day	LC50	33.346
Neutral Organics	: Daphnid	48-hr	LC50	19.983
Neutral Organics	: Green Algae	96-hr	EC50	12.024
Neutral Organics	: Fish	30-day	ChV	3.533
Neutral Organics	: Daphnid		ChV	2.526
Neutral Organics	: Green Algae		ChV	5.032
Neutral Organics	: Fish (SW)	96-hr	LC50	43.601
Neutral Organics	: Mysid Shrimp	96-hr	LC50	22.083
Neutral Organics	: Fish (SW)		ChV	6.516
Neutral Organics	: Mysid Shrimp (SW)		ChV	1.624
Neutral Organics	: Earthworm	14-day	LC50	195.669

Note: * = asterisk designates: Chemical may not be soluble enough to measure this predicted effect.

Neutral Organics:

For Fish LC50 (96-h), Daphnid LC50, Mysid: If the log Kow is greater than 5.0, or if the compound is solid and the LC50 exceeds the water solubility by 10X, no effects at saturation are predicted.

For Fish LC50 (14-day) and Earthworm LC50: If the log Kow is greater than 6.0, or if the compound is solid and the LC50 exceeds the water solubility by 10X, no effects at saturation are predicted.

For Green Algae Acute Toxicity Values: If the log Kow of the chemical is greater than 6.4, or if the compound is solid and the EC50 exceeds the water solubility by 10X, no effects at saturation are predicted for these endpoints.

For All Chronic Toxicity Values: If the log Kow of the chemical is greater than 8.0, or if the compound is solid and the ChV exceeds the water solubility by 10X, no effects at saturation are predicted for these endpoints.

ECOSAR v1.00 SAR Limitations:

Maximum LogKow: 5.0 (Fish 96-hr LC50; Daphnid LC50, Mysid LC50)
Maximum LogKow: 6.0 (Fish 14-day LC50; Earthworm LC50)
Maximum LogKow: 6.4 (Green Algae EC50)
Maximum LogKow: 8.0 (ChV)
Maximum Mol Wt: 1000

HENRYWIN (v3.20) Program Results:

Bond Est : 8.63E-006 atm-m3/mole (8.74E-001 Pa-m3/mole)
Group Est: 6.43E-006 atm-m3/mole (6.52E-001 Pa-m3/mole)

SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

HENRYWIN v3.20 Results

CLASS	BOND CONTRIBUTION DESCRIPTION	COMMENT	VALUE
HYDROGEN	15 Hydrogen to Carbon (aliphatic) Bonds		-1.7952
HYDROGEN	1 Hydrogen to Oxygen Bonds		3.2318
FRAGMENT	8 C-C		0.9304
FRAGMENT	1 C-O		1.0855
RESULT	BOND ESTIMATION METHOD for LWAPC VALUE	TOTAL	3.453

HENRYs LAW CONSTANT at 25 deg C = 8.63E-006 atm-m3/mole
= 3.53E-004 unitless
= 8.74E-001 Pa-m3/mole

	GROUP CONTRIBUTION DESCRIPTION	COMMENT	VALUE
	1 CH3 (X)		-0.62
	4 CH2 (C)(C)		-0.60
	1 CH2 (C)(O)		-0.13
	2 CH (C)(C)(C)		0.48
	1 O-H (C)		4.45
RESULT	GROUP ESTIMATION METHOD for LOG GAMMA VALUE	TOTAL	3.58

```
HENRYs LAW CONSTANT at 25 deg C = 6.43E-006 atm-m3/mole
                                = 2.63E-004 unitless
                                = 6.52E-001 Pa-m3/mole


For Henry LC Comparison Purposes:
  Exper Database:  none available
  User-Entered Henry LC:  not entered
  Henrys LC [via VP/WSol estimate using User-Entered or Estimated values]:
     HLC:  4.901E-006 atm-m3/mole  (4.966E-001 Pa-m3/mole)
     VP:   0.0588 mm Hg (source: MPBPVP)
     WS:   2.02E+003 mg/L (source: WSKOWWIN)


Log Octanol-Air (KOAWIN v1.10) Results:
=======================================

          Log Koa: 6.002

SMILES : C1(C)CCC(CO)CC1
CHEM   :
MOL FOR: C8 H16 O1
MOL WT : 128.22
--------------------------- KOAWIN v1.10 Results -------------------------

Log Koa (octanol/air) estimate:  6.002
    Koa (octanol/air) estimate:  1.006e+006
 Using:
   Log Kow:  2.55  (KowWin est)
   HenryLC:  8.63e-006  atm-m3/mole (HenryWin est)
   Log Kaw:  -3.452  (air/water part.coef.)

 LogKow  : ----  (exp database)
 LogKow  : 2.55 (KowWin estimate)
 Henry LC: --- atm-m3/mole(exp database)
 Henry LC: 8.63e-006 atm-m3/mole (HenryWin bond estimate)

 Log Koa (octanol/air) estimate:  6.002 (from KowWin/HenryWin)


BIOWIN (v4.10) Program Results:
===============================
SMILES : C1(C)CCC(CO)CC1
CHEM   :
MOL FOR: C8 H16 O1
MOL WT : 128.22
--------------------------- BIOWIN v4.10 Results ---------------------------

   Biowin1 (Linear Model Prediction)    :  Biodegrades Fast
   Biowin2 (Non-Linear Model Prediction):  Biodegrades Fast
   Biowin3 (Ultimate Biodegradation Timeframe):  Weeks
   Biowin4 (Primary  Biodegradation Timeframe):  Days
   Biowin5 (MITI Linear Model Prediction)    :  Biodegrades Fast
   Biowin6 (MITI Non-Linear Model Prediction):  Biodegrades Fast
   Biowin7 (Anaerobic Model Prediction):  Biodegrades Fast
   Ready Biodegradability Prediction:  YES

------+-----+-------------------------------------------+---------+---------
 TYPE | NUM |       Biowin1 FRAGMENT DESCRIPTION        |  COEFF  |  VALUE
------+-----+-------------------------------------------+---------+---------
```

Frag	1	Aliphatic alcohol [-OH]	0.1587	0.1587
MolWt	*	Molecular Weight Parameter		-0.0610
Const	*	Equation Constant		0.7475
RESULT		Biowin1 (Linear Biodeg Probability)		0.8452

TYPE	NUM	Biowin2 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	1.1178	1.1178
MolWt	*	Molecular Weight Parameter		-1.8207
RESULT		Biowin2 (Non-Linear Biodeg Probability)		0.9094

A Probability Greater Than or Equal to 0.5 indicates --> Biodegrades Fast
A Probability Less Than 0.5 indicates --> Does NOT Biodegrade Fast

TYPE	NUM	Biowin3 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	0.1600	0.1600
MolWt	*	Molecular Weight Parameter		-0.2833
Const	*	Equation Constant		3.1992
RESULT		Biowin3 (Survey Model - Ultimate Biodeg)		3.0758

TYPE	NUM	Biowin4 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	0.1294	0.1294
MolWt	*	Molecular Weight Parameter		-0.1850
Const	*	Equation Constant		3.8477
RESULT		Biowin4 (Survey Model - Primary Biodeg)		3.7922

Result Classification: 5.00 -> hours 4.00 -> days 3.00 -> weeks
(Primary & Ultimate) 2.00 -> months 1.00 -> longer

TYPE	NUM	Biowin5 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	0.1611	0.1611
Frag	1	Methyl [-CH3]	0.0004	0.0004
Frag	1	-CH2- [linear]	0.0494	0.0494
Frag	4	-CH2- [cyclic]	0.0197	0.0789
Frag	2	-CH - [cyclic]	0.0124	0.0249
MolWt	*	Molecular Weight Parameter		-0.3814
Const	*	Equation Constant		0.7121
RESULT		Biowin5 (MITI Linear Biodeg Probability)		0.6455

TYPE	NUM	Biowin6 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	1.0041	1.0041
Frag	1	Methyl [-CH3]	0.0194	0.0194
Frag	1	-CH2- [linear]	0.4295	0.4295
Frag	4	-CH2- [cyclic]	0.2365	0.9461

Frag	2	-CH - [cyclic]	-0.1295	-0.2589
MolWt	*	Molecular Weight Parameter		-3.7014
RESULT		Biowin6 (MITI Non-Linear Biodeg Probability)		0.7240

A Probability Greater Than or Equal to 0.5 indicates --> Readily Degradable
A Probability Less Than 0.5 indicates --> NOT Readily Degradable

TYPE	NUM	Biowin7 FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	0.1328	0.1328
Frag	1	Methyl [-CH3]	-0.0796	-0.0796
Frag	1	-CH2- [linear]	0.0260	0.0260
Frag	4	-CH2- [cyclic]	-0.1200	-0.4801
Frag	2	-CH - [cyclic]	0.0395	0.0789
Const	*	Equation Constant		0.8361
RESULT		Biowin7 (Anaerobic Linear Biodeg Prob)		0.5141

A Probability Greater Than or Equal to 0.5 indicates --> Biodegrades Fast
A Probability Less Than 0.5 indicates --> Does NOT Biodegrade Fast

Ready Biodegradability Prediction: (YES or NO)

Criteria for the YES or NO prediction: If the Biowin3 (ultimate survey model) result is "weeks" or faster (i.e. "days", "days to weeks", or "weeks" AND the Biowin5 (MITI linear model) probability is >= 0.5, then the prediction is YES (readily biodegradable). If this condition is not satisfied, the prediction is NO (not readily biodegradable). This method is based on application of Bayesian analysis to ready biodegradation data (see Help). Biowin5 and 6 also predict ready biodegradability, but for degradation in the OECD301C test only; using data from the Chemicals Evaluation and Research Institute Japan (CERIJ) database.

BioHCwin (v1.01) Program Results:

SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22

BioHCwin v1.01 Results

NO Estimate Possible ... Structure NOT a Hydrocarbon
(Contains atoms other than C, H or S (-S-))

AEROWIN Program (v1.00) Results:

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:
Vapor pressure (liquid/subcooled): 7.07 Pa (0.053 mm Hg)
Log Koa (Koawin est): 6.002
Kp (particle/gas partition coef. (m3/ug)):
Mackay model : 4.25E-007
Octanol/air (Koa) model: 2.47E-007
Fraction sorbed to airborne particulates (phi):

```
      Junge-Pankow model     :  1.53E-005
      Mackay model           :  3.4E-005
      Octanol/air (Koa) model:  1.97E-005


AOP Program (v1.92) Results:
============================
SMILES : C1(C)CCC(CO)CC1
CHEM   :
MOL FOR: C8 H16 O1
MOL WT : 128.22
------------------- SUMMARY (AOP v1.92): HYDROXYL RADICALS (25 deg C) --------
Hydrogen Abstraction       =  16.3855 E-12 cm3/molecule-sec
Reaction with N, S and -OH =   0.1400 E-12 cm3/molecule-sec
Addition to Triple Bonds   =   0.0000 E-12 cm3/molecule-sec
Addition to Olefinic Bonds =   0.0000 E-12 cm3/molecule-sec
Addition to Aromatic Rings =   0.0000 E-12 cm3/molecule-sec
Addition to Fused Rings    =   0.0000 E-12 cm3/molecule-sec

   OVERALL OH Rate Constant =  16.5255 E-12 cm3/molecule-sec
   HALF-LIFE =     0.647 Days (12-hr day; 1.5E6 OH/cm3)
   HALF-LIFE =     7.767 Hrs
------------------- SUMMARY (AOP v1.91): OZONE REACTION (25 deg C) -----------

              ******  NO OZONE REACTION ESTIMATION ******
              (ONLY Olefins and Acetylenes are Estimated)

Experimental Database:  NO Structure Matches
Fraction sorbed to airborne particulates (phi):
  2.46E-005 (Junge-Pankow, Mackay avg)
  1.97E-005 (Koa method)
     Note: the sorbed fraction may be resistant to atmospheric oxidation



KOCWIN Program (v2.00) Results:
===============================
SMILES : C1(C)CCC(CO)CC1
CHEM   :
MOL FOR: C8 H16 O1
MOL WT : 128.22
--------------------------  KOCWIN v2.00 Results  --------------------------

  Koc Estimate from MCI:
  ----------------------
        First Order Molecular Connectivity Index  ..........  :  4.326
        Non-Corrected Log Koc (0.5213 MCI + 0.60)  ..........  :  2.8548
        Fragment Correction(s):
                1   Aliphatic Alcohol  (-C-OH)  ..........  : -1.3179
        Corrected Log Koc  ..................................  :  1.5369

                        Estimated Koc:  34.42  L/kg   <==========

  Koc Estimate from Log Kow:
  --------------------------
        Log Kow  (Kowwin estimate)  ..........................  :  2.55
        Non-Corrected Log Koc (0.55313 logKow + 0.9251)  ....  :  2.3356
        Fragment Correction(s):
                1   Aliphatic Alcohol  (-C-OH)  ..........  : -0.4114
        Corrected Log Koc  ..................................  :  1.9241

                        Estimated Koc:  83.97  L/kg   <==========
```

HYDROWIN Program (v2.00) Results:
==========
SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22
---------- HYDROWIN v2.00 Results ----------

Currently, this program can NOT estimate a hydrolysis rate constant for the type of chemical structure entered!!

ONLY Esters, Carbamates, Epoxides, Halomethanes (containing 1-3 halogens), Specific Alkyl Halides & Phosphorus Esters can be estimated!!

When present, various hydrolyzable compound-types will be identified. For more information, (Click OVERVIEW in Help or see the User's Guide)

***** CALCULATION NOT PERFORMED *****

BCFBAF Program (v3.00) Results:
==========
SMILES : C1(C)CCC(CO)CC1
CHEM :
MOL FOR: C8 H16 O1
MOL WT : 128.22
---------- BCFBAF v3.00 ----------
Summary Results:
Log BCF (regression-based estimate): 1.35 (BCF = 22.2 L/kg wet-wt)
Biotransformation Half-Life (days) : 0.342 (normalized to 10 g fish)
Log BAF (Arnot-Gobas upper trophic): 1.46 (BAF = 29.2 L/kg wet-wt)

Log Kow (experimental): not available from database
Log Kow used by BCF estimates: 2.55

Equation Used to Make BCF estimate:
Log BCF = 0.6598 log Kow - 0.333 + Correction

Correction(s): Value
No Applicable Correction Factors

Estimated Log BCF = 1.347 (BCF = 22.23 L/kg wet-wt)

==========
Whole Body Primary Biotransformation Rate Estimate for Fish:
==========

TYPE	NUM	LOG BIOTRANSFORMATION FRAGMENT DESCRIPTION	COEFF	VALUE
Frag	1	Aliphatic alcohol [-OH]	-0.0616	-0.0616
Frag	1	Methyl [-CH3]	0.2451	0.2451
Frag	1	-CH2- [linear]	0.0242	0.0242
Frag	4	-CH2- [cyclic]	0.0963	0.3850
Frag	2	-CH - [cyclic]	0.0126	0.0252
L Kow	*	Log Kow = 2.55 (KowWin estimate)	0.3073	0.7825
MolWt	*	Molecular Weight Parameter		-0.3288
Const	*	Equation Constant		-1.5058

RESULT	LOG Bio Half-Life (days)	-0.4654
RESULT	Bio Half-Life (days)	0.3424
NOTE	Bio Half-Life Normalized to 10 g fish at 15 deg C	

Biotransformation Rate Constant:
 kM (Rate Constant): 2.024 /day (10 gram fish)
 kM (Rate Constant): 1.138 /day (100 gram fish)
 kM (Rate Constant): 0.6401 /day (1 kg fish)
 kM (Rate Constant): 0.36 /day (10 kg fish)

Arnot-Gobas BCF & BAF Methods (including biotransformation rate estimates):
 Estimated Log BCF (upper trophic) = 1.465 (BCF = 29.15 L/kg wet-wt)
 Estimated Log BAF (upper trophic) = 1.465 (BAF = 29.15 L/kg wet-wt)
 Estimated Log BCF (mid trophic) = 1.338 (BCF = 21.8 L/kg wet-wt)
 Estimated Log BAF (mid trophic) = 1.338 (BAF = 21.8 L/kg wet-wt)
 Estimated Log BCF (lower trophic) = 1.294 (BCF = 19.68 L/kg wet-wt)
 Estimated Log BAF (lower trophic) = 1.294 (BAF = 19.69 L/kg wet-wt)

Arnot-Gobas BCF & BAF Methods (assuming a biotransformation rate of zero):
 Estimated Log BCF (upper trophic) = 1.585 (BCF = 38.45 L/kg wet-wt)
 Estimated Log BAF (upper trophic) = 1.609 (BAF = 40.61 L/kg wet-wt)

Volatilization From Water

Chemical Name:

Molecular Weight : 128.22 g/mole
Water Solubility : -----
Vapor Pressure : -----
Henry's Law Constant: 6.43E-006 atm-m3/mole (estimated by Group SAR Method)

	RIVER	LAKE
Water Depth (meters):	1	1
Wind Velocity (m/sec):	5	0.5
Current Velocity (m/sec):	1	0.05
HALF-LIFE (hours) :	104.3	1232
HALF-LIFE (days) :	4.344	51.35

STP Fugacity Model: Predicted Fate in a Wastewater Treatment Facility
(using 10000 hr Bio P,A,S)
PROPERTIES OF:

Molecular weight (g/mol)	128.22
Aqueous solubility (mg/l)	0
Vapour pressure (Pa)	0
(atm)	0
(mm Hg)	0
Henry 's law constant (Atm-m3/mol)	6.43E-006
Air-water partition coefficient	0.000262968
Octanol-water partition coefficient (Kow)	354.813
Log Kow	2.55
Biomass to water partition coefficient	71.7627

Temperature [deg C] 25

Biodeg rate constants (h^-1),half life in biomass (h) and in 2000 mg/L MLSS (h):

-Primary tank	0.00	1255.11	10000.00
-Aeration tank	0.00	1255.11	10000.00
-Settling tank	0.00	1255.11	10000.00

STP Overall Chemical Mass Balance:

	g/h	mol/h	percent
Influent	1.00E+001	7.8E-002	100.00
Primary sludge	1.08E-001	8.5E-004	1.08
Waste sludge	2.05E-001	1.6E-003	2.05
Primary volatilization	3.37E-003	2.6E-005	0.03
Settling volatilization	9.13E-003	7.1E-005	0.09
Aeration off gas	2.31E-002	1.8E-004	0.23
Primary biodegradation	1.98E-003	1.5E-005	0.02
Settling biodegradation	5.90E-004	4.6E-006	0.01
Aeration biodegradation	7.77E-003	6.1E-005	0.08
Final water effluent	9.64E+000	7.5E-002	96.41
Total removal	3.59E-001	2.8E-003	3.59
Total biodegradation	1.03E-002	8.1E-005	0.10

Level III Fugacity Model (Full-Output):

Chem Name :
Molecular Wt: 128.22
Henry's LC : 6.43e-006 atm-m3/mole (Henrywin program)
Vapor Press : 0.0588 mm Hg (Mpbpwin program)
Log Kow : 2.55 (Kowwin program)
Soil Koc : 34.4 (KOCWIN MCI method)

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	1.59	15.5	1000
Water	32.5	360	1000
Soil	65.8	720	1000
Sediment	0.106	3.24e+003	0

	Fugacity (atm)	Reaction (kg/hr)	Advection (kg/hr)	Reaction (percent)	Advection (percent)
Air	3.7e-011	867	194	28.9	6.48
Water	9.97e-011	766	398	25.5	13.3
Soil	1.99e-009	775	0	25.8	0
Sediment	8.91e-011	0.277	0.0259	0.00925	0.000865

Persistence Time: 408 hr
Reaction Time: 508 hr
Advection Time: 2.07e+003 hr
Percent Reacted: 80.3
Percent Advected: 19.7

Half-Lives (hr), (based upon Biowin (Ultimate) and Aopwin):
Air: 15.53
Water: 360
Soil: 720
Sediment: 3240
Biowin estimate: 3.076 (weeks)

Advection Times (hr):
Air: 100
Water: 1000
Sediment: 5e+004

Warner, Sue

Subject: MCHM DEGREDATION DISCUSSION
Location: Conf Call

Start: Tue 2/11/2014 10 00 AM
End: Tue 2/11/2014 11 00 AM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Arguto, William
Required Attendees: Gray, Wendy, Magnuson, Matthew, Weber, Eric, Caporale, Cynthia, binetti, victoria, Hedrick, Elizabeth, Warner, Sue
Optional Attendees: Allgeier, Steve

Importance: High

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Please see the discussion below that was asked of the state regarding the degradation of MCHM We wanted to convene a call to discuss the issues tomorrow if possible.

Cindy – could you forward this to the OPPT folks

I will forward the call in number separately

Thanks
Bill

Dear Governor Tomblin and others

I cannot understand why some chemist from West Virginia University or some other university has not informed you on the following

There are registered pesticides with similar formulas such as cyclohexane, cyclohexanol, cyclohexanone and etc

MCHM is a cyclohexane Cyclohexane can degrade to cyclohexanol a pesticide and to nitrophenol (p-nitrophenol is a pesticide) and to nitrosamines which are carcinogens A pesticide chemist who has reviewed pesticide data on fate in transport of pesticides in air, water, soil, plants and animals should be able to predict this

Since there is little if any data on the degradation of MCHM in air, water, soil, plants and animals one can use predictive methods knowing that such methods can have a large percent error However they are helpful The USEPA should have residue data on the pesticide to help draw some conclusions There is a Jujitsu CAChe model that can predict toxicity and etc If the physical chemical properties are known such as Koc, Kow, WS and OW they can be used to predict fate in the environment A prediction of what can happen is better than no to little data

Ex. 5 - Deliberative

I would never drink the water until I knew if the following was discerned in the drinking water and in the river

- *Are nitrosamines which are carcinogens present?*
- *Are radioactive chemicals present?*
- *What residues (parent and degradates) where they looking for?*

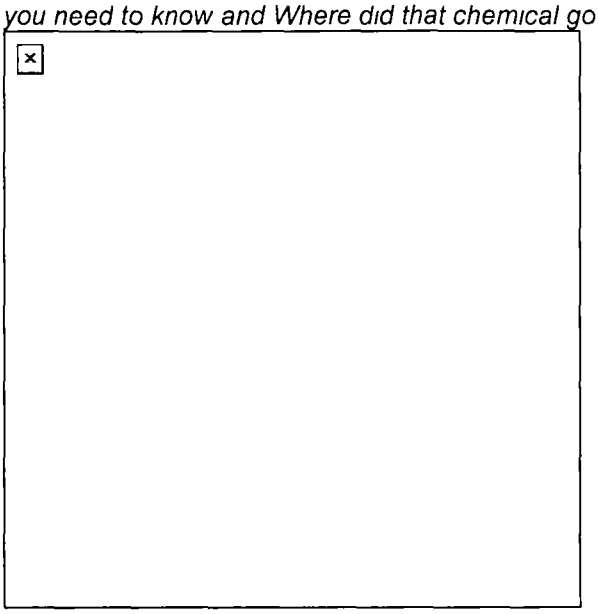
✓*I would also like to have seen the residue data (residue meaning parent and degradates), the extraction method(s) and determinative method(s) used to discern the presence or absence*
✓*Do they even know what degradates to look for?*

My only request is to let the people know about this and to protect them especially vulnerable children, pregnant women, nursing mothers, persons with immune disorders, elderly and wounded veterans

Respectfully submitted,

Ronald E Ney, Jr , Ph D , Advocate for Valid Science

- *Retired FDA, USDA and USEPA FIFRA Pesticide Chemist and Science Advisor for RCRA regulations, Lecturer, Author of Fate and Transport of Organic Chemicals in the Environment, third edition, Chemicals What you need to know and Where did that chemical go?*



USEPA Office of Solid Waste and Emergency Response Environmental Remediation Technologies Student Manual (5201G) December 2011 refers to the book by Ronald E Ney, Jr , Ph D Where Did That Chemical Go? for site clean-up

- *Chief of Environmental Chemistry, USEPA, for Fate and Transport of Pesticides in Air, Water, Soil, Plants and Animals, and Modeling I wrote the data requirements for 40CFR § 158 290 and § 158 1300 Subpart N*
- *Former Real Estate Broker, Certified Real Estate Appraiser, Adjunct Assistant Professor for General Chemistry, Real Estate Appraisal and other environmental courses*
- *Formally registered as an Environmental Professional with the State of California*
- *Expert witness for DOJ, USEPA and law firms for pesticide and hazardous waste cases, CERCLA sites and is a federally protected witness*

➢ *Certificate of Achievement and entered into the 16th edition of AMERICAN MEN AND WOMEN OF SCIENCE, January 1987*
➢ *In 1994-1995, included in Marquis WHO'S WHO IN SCIENCE AND ENGINEERING, Marquis WHO'S WHO in America*
➢ *In 1997, included in the International Who's Who in Cambridge, England*

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Warner, Sue

From: Caporale, Cynthia
Sent: Tuesday, February 25, 2014 8:04 AM
To: Warner, Sue; Gundersen, Jennifer
Subject: FW: WV Bullet Stuff
Attachments: Congressional bullets_KR Draft (2)_vb.docx; annual report glycols_rev.docx

Would the two of you prepare a write-up that summarizes what we did for Charleston Spill (WV Spill)? A template to use is attached. This isn't a rush but could we make 3/15 the due date?

From: Burns, Francis
Sent: Monday, February 24, 2014 5:13 PM
To: Caporale, Cynthia; Matlock, Dennis
Subject: FW: WV Bullet Stuff

Cindy, Dennis:

Ex. 5 - Deliberative This may help in your papers.

Fran

From: binetti, victoria
Sent: Monday, February 24, 2014 3:49 PM
To: Rose, Kenneth; Burns, Francis; Arguto, William
Cc: Wright, Dave; saxe, jennie
Subject: RE: WV Bullet Stuff

Ex. 5 - Deliberative
background.--Vicky

From: Rose, Kenneth
Sent: Monday, February 24, 2014 3:05 PM
To: Burns, Francis; binetti, victoria; Arguto, William
Cc: Wright, Dave; saxe, jennie
Subject: RE: WV Bullet Stuff

All,
Here is my attempt to shorten to one page. Please revise as necessary.

-Ken

Kenneth I. Rose III, Acting Communications Coordinator
Hazardous Site Cleanup Division
U.S. Environmental Protection Agency (Region III)
215.814.3147
rose.kenneth@epa.gov

From: Burns, Francis
Sent: Monday, February 24, 2014 2:24 PM
To: binetti, victoria; Arguto, William

Cc: Wright, Dave; saxe, jennie; Rose, Kenneth
Subject: WV Bullet Stuff

Vicky, Bill:

See attached and please revise as necessary.

Thanks,
Fran

Ex. 5 - Deliberative

Ex. 5 - Deliberative

WV TAP
WEST VIRGINIA TESTING ASSESSMENT PROJECT

The Crude MCHM Chemical Spill 10-Home Study: Tap Water Chemical Analysis

Andrew J. Whelton[1], Jeffrey S. Rosen[2], Jennifer Clancy[2], Timothy Clancy[2], Ayhan Ergul[2]
1 University of South Alabama, 2 Corona Environmental Consulting

May 5, 2014

1.0 Introduction

As part of the WV TAP project Task 3, ten households affected by the crude MCHM that was spilled into the Elk River and contaminated the Charleston, WV region's drinking water were surveyed and sampled The objective of Task 3 was to assess concentration and variability of MCHM in homes in a focused study Data resulting from the sampling effort will be used to support the design of a larger, more comprehensive sampling and assessment program for the nine counties affected Households were surveyed and sampled in eight (Boone, Cabell, Clay, Kanawha, Lincoln, Logan, Putnam, and Roane) of the nine counties affected by the chemical spill and between February 11, 2014 to February 18, 2014

No affected homes in Jackson County were visited because the Jackson County residents contacted declined participation and switched to private well water in response to the contamination incident. Jackson County had the lowest number of West Virginia American Water (WVAW) customers of the nine counties affected A second home in Putnam County near the Jackson County line was visited in lieu of visiting a residence in Jackson County.

During each household visit, three tasks were completed·

1. Residents were interviewed by the WV TAP project team;
2. Basic chemical and physical properties (temperature, pH, turbidity, chlorine residual) were determined for tap water from kitchen faucets and bathroom fixtures; and
3 Water samples were collected for detailed analyses at commercial laboratories.

Results of the tap water chemical analyses are presented in this document. Results of the resident interviews are presented in a companion report Together, these two documents describe results of the WV TAP 10 home study

2.0 Methods

2 1 Field Water Sample Collection, Analysis, and Shipping

Three individuals conducted home sampling and surveying Premise plumbing sampling was done for four tap conditions in the following order: (1) kitchen cold tap; (2) kitchen hot tap; (3) cold water from the most frequently used bathtub; and (4) hot water from the most frequently used bathtub. Onsite water quality measurements included water temperature, pH, turbidity, free and total chlorine, and odor The physical measurements were taken at each tap before sample collection The time was recorded at the beginning of sampling at each tap, and when each sample bottle for chemical analysis was collected.

Total and free chlorine were measured separately using the HACH® Pocket Colorimeter™ II, Chlorine (Free and Total). The *N,N*-diethyl-*p*-phenyldiamine (DPD) reagents used were as follows. for total chlorine measurements, DPD reagent A3035, expiration date, 08/2018; and for free chlorine DPD reagent A3238, expiration date 02/2018

Water temperature and pH levels were measured using a Thermo Scientific Orion 5 Star™ portable meter The pH meter was calibrated at the beginning of each day of sampling using Fisher pH standards at pH 4, 7, and 10. Turbidity measurements were made using a HACH® 2100Q™ portable turbidimeter Water samples were tested immediately upon collection at the temperatures recorded After the physical measurements were recorded, one sampler collected approximately 120 mL tap water in a 250 mL beaker and covered the sample The sample was then shaken several times while covered and presented to one of the three samplers who smelled it and made a record of the odor. In many instances the individual asked for a second sample before recording results. Each of the three samplers recorded results independently of the others so as not to influence one another At the conclusion of the physical measurements at each tap, sample collection for laboratory analysis began

Nine samples were collected for each tap condition. One set of triplicate samples was sent to the commercial laboratory ALS for analysis, a second set of triplicate samples was sent to ALS for archiving and a third set of triplicate samples was sent to the commercial laboratory Eurofins for analysis The commercial laboratories provided sample containers for all samples ALS samples for 4-methylcyclohexanemethanol (MCHM) and propylene glycol phenyl ether (PPH) were collected in a single 1 L amber glass bottle with 1 mg sodium thiosulfate and samples for total organic carbon (TOC) analysis were collected in 125 mL or 250 mL plastic bottles with sulfuric acid preservative Eurofins samples for MCHM/PPH were collected in 1 L amber glass bottles and TOC samples were collected in 125 mL glass bottles. Sampling and recording at each tap condition took 5 minutes to 7 minutes.

After the tap condition samples were collected, a set of matrix spike (MS) and field blank (FB) samples were collected for each analytical laboratory and for archiving. MS and FB samples were collected in the same manner as tap water samples. MS samples were prepared for kitchen cold tap and kitchen hot tap conditions. The FB was a clean sample bottle from each laboratory filled at the kitchen sink counter with laboratory-purchased deionized (DI) water that was free of the analytes of interest Field blanks are used to assess whether contamination with the analyte of interest (MCHM or PPH) occurred during sampling.

As soon as sampling was completed the bottles were placed in coolers and transported to a local hotel for icing, repacking, and shipping to the designated laboratory. Three laboratories, ALS Environmental Laboratory (Charleston, WV), Eurofins Lancaster Laboratories (Lancaster, PA) and Eurofins Analytical Laboratories (Monrovia, CA) were selected for this project Samples for ALS Environmental Laboratory were picked each morning by ALS staff at 7 am. Coolers for shipment to Eurofins Laboratories were sent by FedEx® overnight and received on the next business day after shipping All samples were received within hold times at both Eurofins Laboratories. Upon sample receipt at Eurofins Laboratories, cooler temperatures sometimes slightly exceeded the recommended standard 4°C for most drinking water samples In these cases half of the samples were hot tap water, which is not typical of drinking water samples

2 2 Analysis Conducted by Commercial Laboratories

The three laboratories that analyzed samples for this study reported different method detection limits (MDL) and minimum reporting limits (MRL) for TOC, PPH and 4-MCHM (**Table 1**) The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte (USCFR 1986). The MRL is the minimum concentration that can be reported as a quantitated value for a target analyte in a sample following analysis This defined concentration can be no lower than the concentration of the lowest calibration standard for that analyte, and can be used only if acceptable quality control criteria for the analyte at this concentration are met Put simply, the MDL indicates that the analyte is present at a concentration of greater than zero, and the MRL is the level at which the concentration of the analyte can be reported with confidence

Table 1. Minimum Detection Limits and Minimum Reporting Limits for the Two Commercial Laboratories

Contaminant[2]	ALS Environmental Laboratory Charleston, West Virginia		Eurofins Laboratories[1] Lancaster, Pennsylvania Monrovia, California	
TOC, ppm	MDL = 0 07	MRL = 0.50	MDL = 0 04	MRL = 0 30
PPH, ppb	MDL = 3.7	MRL = 5 1	MDL = 0.5	MRL = 1.0
4-MCHM, ppb	MDL = 2.7	MRL = 5 0	MDL = 0.5	MRL = 1 0

1 Monrovia, California carried out TOC testing while Lancaster, Pennsylvania conducted 4-MCHM and PPH analysis

2. Parts per million (ppm); parts per billion (ppb)

2 2 1 ALS Environmental Laboratory. WV TAP samples were analyzed for TOC, MCHM, and PPH TOC was determined via Standard Method 5310C Samples exceeding the calibration range were diluted and reanalyzed The instruments used for analysis were a 1010 Analyzer coupled with a 1051 Autosampler and a 1030W Analyzer coupled with a 1088 Autosampler, both manufactured by OI analytical Before sample analysis, the instrument was calibrated using five calibration standards.

A method blank, a laboratory control sample (LCS) and a matrix spike/matrix spike duplicate (MS/MSD) pair were analyzed to serve as batch quality control The method blank acceptance criterion was no detection of TOC above the reporting limit The LCS (reagent water spiked at approximately the mid-point of the calibration curve) acceptance criterion was acceptable recovery within the laboratory control limits Both method blank and LCS criteria needed to be met for the batch to be considered acceptable. The MS/MSD recoveries were also compared to laboratory control limits, and if outside of those, the parent sample would be qualified

4-MCHM and PPH were examined according to standard US Environmental Protection Agency (US EPA) SW-846 methods for both preparation and analysis. The water samples, (approximately 1000 mL), were extracted using method 3510C with methylene chloride as the extraction solvent under an acidic pH The extract was initially concentrated on a steam bath using a Kuderna Danish (KD) apparatus, and brought down to a final volume of 1.0 mL using nitrogen evaporation. The extract was then analyzed using method 8270C, which is a gas chromatograph/mass spectrometer (GC/MS) analysis technique. Prior to analysis the internal standards were added to each sample per the method requirements.

Before sample analysis, the GC/MS was tuned to meet the method Decafluorotriphenylphosphine (DFTPP) relative mass abundance criteria and calibrated using a six calibration standards 4-MCHM was calibrated from 5 µg/mL to 500 µg/mL and PPH was calibrated from 2.5 µg/mL to 250 µg/mL. Instrument performance was verified prior to each 12-hour analytical sequence by the analysis of the DFTPP tune solution and continuing calibration standards, which were compared to the initial calibration curve ALS instrumentation used for this project was an Agilent 5890/5973 GC/MS system

With each preparation batch (not to exceed 20 field samples), a method blank, a LCS and a MS/MSD pair were extracted to serve as batch quality control The method blank acceptance criterion was no detection of target analytes above the reporting limit. The LCS (reagent water spiked at approximately the mid-point of the calibration curve) acceptance criterion was acceptable recoveries within the laboratory control limits for both of the target compounds Both method blank and LCS criteria needed to be met for the extraction batch to be considered acceptable. The MS/MSD recoveries were also compared to laboratory control limits, and if outside of those, the parent sample would be qualified All field and quality control samples were spiked with the surrogate standards listed in EPA SW-846, Method 8270C to measure extraction efficiency The surrogate recoveries were compared to laboratory control limits and, if within those limits, the results were considered acceptable and valid to be reported

2 2 2 Eurofins Laboratories (Lancaster and Monrovia) 4-MCHM and PPH analyses were carried out by application of the following methods. A water sample was serially extracted with methylene chloride following EPA SW-846, Method 3510 The resulting extract was reduced in volume and an aliquot was injected into a GC/MS The GC/MS analytical system was tuned and calibrated following the principles outlined in EPA SW-846, Method 8270D. This included tuning the system to DFTPP relative mass abundance criteria and calibration using a minimum of five calibration points from 1 ppb to 60 ppb An internal standard based initial calibration was used The analytical system was tuned and the calibration responses checked, relative to the initial calibration responses, every 12 hours.

Field samples were extracted in batches that were not to exceed 20 field samples With every extraction batch, a method blank, a LCS and an MRL LCS were extracted to monitor the effectiveness of the extraction batch. A method blank was free of target compounds to be considered acceptable. The LCS (which was an aliquot of laboratory water spiked at approximately the mid-point of the calibration curve) and the MRL LCS (laboratory water spiked at or near the MRL) must have demonstrated acceptable recoveries of the target compounds for the extraction batch to be considered acceptable Additionally, every field sample, method blank, LCS and MRL LCS were spiked with a surrogate standard that also went through the extraction process. If the surrogate standard recovery was acceptable then the inference was that any target compound present in the field sample was recovered The work was performed on an Agilent 7890 GC with an Agilent 5975 MSD

3.0 RESULTS AND DISCUSSION

3.1 Tap Water Analysis for Basic Parameters

On-site measurements of tap water quality are summarized in **Table 2.** Tap water temperature is important because temperature influences the contaminant volatility Volatilized compounds can contribute to resident chemical exposure and off-odors Cold tap water temperatures ranged from

6 9°C to 21 9°C and hot water temperature ranged from 31.6°C to 58.1°C. Water pH values were within the US EPA Secondary Maximum Contaminant Level (MCL) of 6 5 to 9 5 Nearly all the tap water pH levels found in homes however, exceeded the pH levels leaving WVAW (pH 7.1 to pH 7 3). No chlorine concentrations exceeded the US EPA Primary MCL of 4 0 ppm As expected, both total and free chlorine concentrations were greater for cold water than hot water within homes Tap water turbidity levels were in the expected range and varied from 0 05 NTU to 1.47 NTU.

Table 2. Range of Tap Water Quality Conditions Observed Across all Ten Homes

Parameter[1]	Kitchen Sink Faucet		Bathtub Faucet	
	Cold	Hot	Cold	Hot
Temperature, °C	6 9 to 21 9	31 6 to 47 7	7 0 to 14 6	33.6 to 58 1
Water pH, unitless	7.5 to 8 3	7 0 to 7 5	7 4 to 8.1	7.0 to 7 5
Total Chlorine, ppm	2 2 to 2.8	0.2 to 2.4	2 0 to 3 1	0.6 to 2 4
Free Chlorine, ppm	2 0 to 2.9	0.1 to 2.0	2 0 to 2 9	0.6 to 2 1
Turbidity, NTU	0 05 to 1 47	0 05 to 0.65	0.06 to 1 62	0.07 to 0 54

1. NTU = Nephelometric turbidity units; Total chlorine represents free chlorine and combined chlorine results; Results represent a single measurement conducted at each tap within each home

Tap water odors were detected in all 10 homes studied The sampling team frequently noted licorice, sweet, and chlorine odors. Musty odors were reported less frequently Licorice odors (considered to be a typical odor of MCHM) were only reported in three of the 10 homes studied. These odors were considered "sharp" and were similar to the licorice odor detected by one team member January 17-22, 2014 during a previous tap water sampling visit to Kanawha, Lincoln, and Putnam Counties. The intensity of the licorice odors observed during the present study were significantly less than those observed in January following discovery of the contaminated tap water Sweet odors were reported in 7 of 10 homes visited. Esweet ppt?

Chlorine odors were detected in tap water from 9 of the 10 homes studied, and were reported less frequently for cold water than for hot water samples. This finding is likely due to the fact that hot water had less chlorine present than cold water (**Table 2**) Consumers have been shown to detect chlorine odors in tap water at 25°C when chlorine is present at 0.28 ppm [pH 5] and 0 36 ppm [pH 10] (Krasner and Barrett 1984) With the exception of a single water sample, all tap water contained chlorine above both odor threshold values Though, for the single 0 1 ppm chlorine water sample, the sampling team detected a chlorine odor likely because its temperature was 41°C and volatilized readily from the tap water A musty odor was reported in two of the ten homes studied, but only in hot water samples and not from both taps In some cases, licorice, sweet, and musty odors were observed even when chlorine odors were also detected

3 2 Organic Carbon Tap Water Levels

TOC concentrations were quantified for premise plumbing because TOC is a general indicator for organic contaminants present in drinking water and has been proposed by the US EPA and others as a metric for determining if drinking water contamination exists (Murray et al., 2010, Hall et al., 2007) There are no Federal or State drinking water regulatory standards for TOC tap water levels because TOC represents many compounds (not a single contaminant), and because the compounds contributing to the TOC may be benign

TOC concentrations across and within all homes were relatively similar and were generally between 0.72 ppm and 0 92 ppm (**Figures 1 and 2**) A very high TOC concentration was observed for a single sample (6 3 ppm, house 2, kitchen tap cold water, ALS Environmental Laboratory) and was treated as an outlier Concentrations observed in the water samples are typical of those in finished drinking waters and provide no information regarding the extent of contamination by MCHM or other potential contaminants. At the concentrations of interest, MCHM, PPH and other potential decay products of MCHM would make up a small portion of the overall organic carbon present in the tap water Ninety percent of all TOC concentrations were less than 0 90 ppm Standard deviation values (an indication of how much variation in TOC there is between samples collected in the same house) were relatively small, ranging from 0 ppm to 0 18 ppm

3.2 PPH and 4-MCHM

No PPH was detected in any tap water sample by either commercial laboratory. No 4-MCHM was detected in any tap water sample by ALS Environmental Laboratory, but the Eurofins Lancaster Laboratory detected 4-MCHM in 105 of the 120 samples analyzed. The 105 detections can be attributed to Eurofins Lancaster Laboratory's lower MDL (**Table 1**)

4-MCHM was detected in all 10 homes, but all observed concentrations were substantially less than the 10 ppb State of West Virginia Screening Level (**Figure 3**) Ninety percent of samples had a 4-MCHM concentration equal to or less than 2 4 ppb. Home #8 had the greatest mean 4-MCHM concentration (4.4 $\pm$ 1 4 ppb), and the highest observed concentration (6.1 ppb). No consistent association was found between 4-MCHM concentrations and tap condition

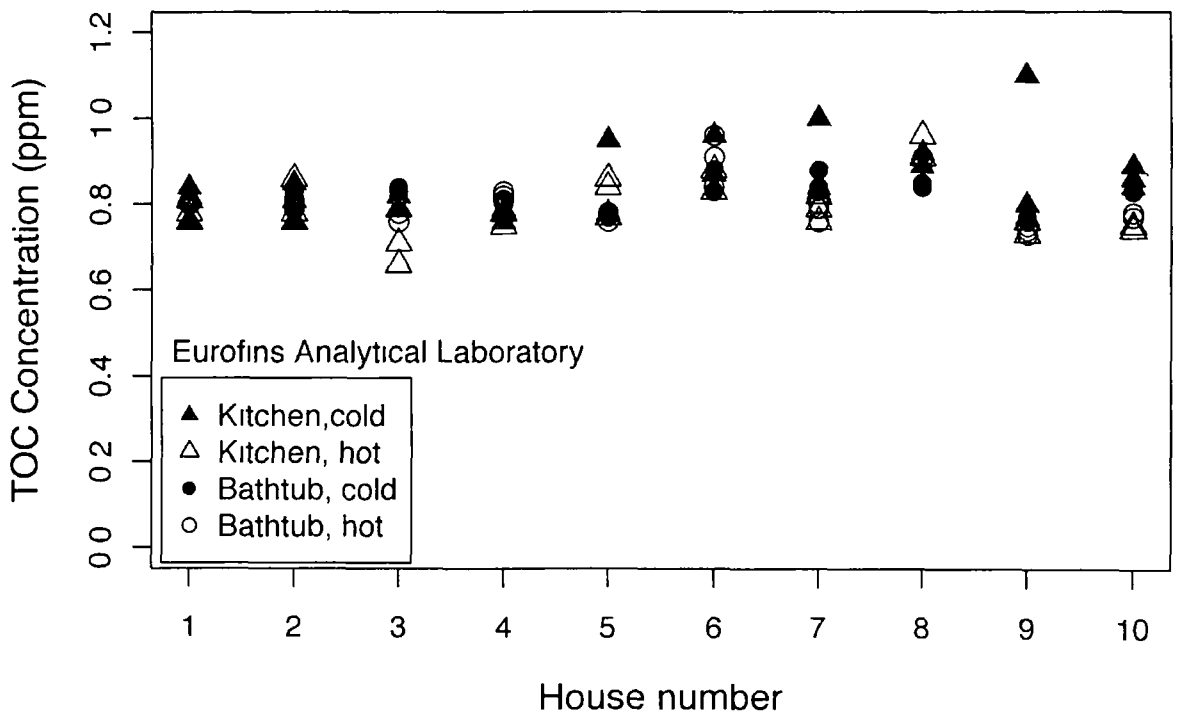

Figure 1. Mean TOC Concentration Across Homes as Reported by Eurofins Analytical Laboratory

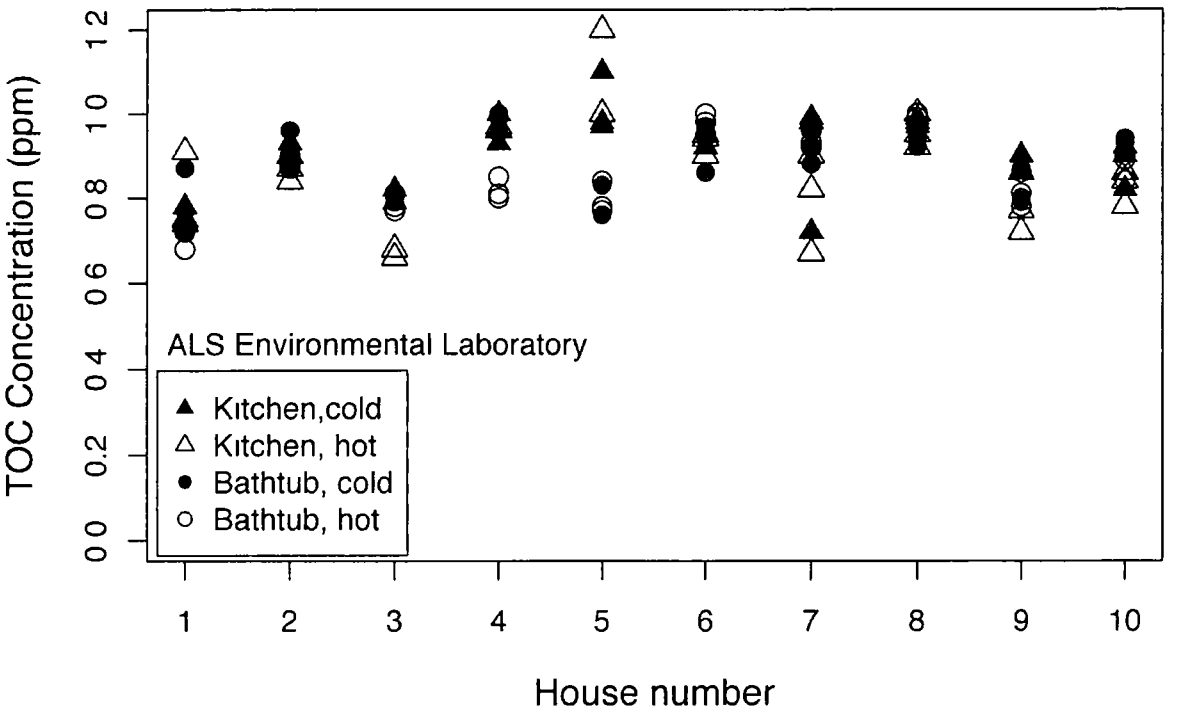

Figure 2. Mean TOC Concentration Across Homes as Reported by ALS Environmental Laboratory. A single apparent outlier (TOC = 6.3 mg/L for house 2) was omitted from the plot

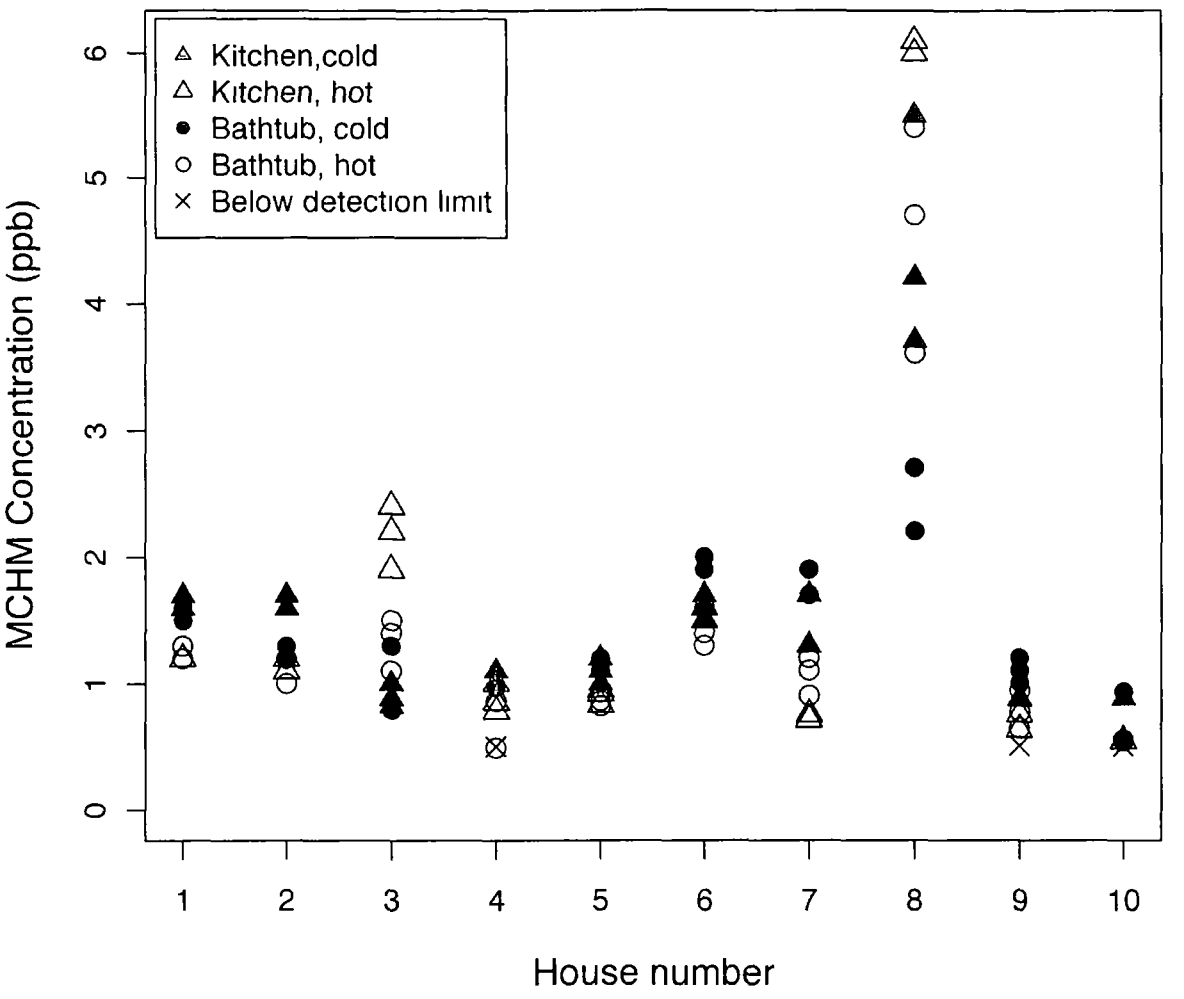

Figure 3. 4-MCHM Concentration by Home and Tap Condition. Only Eurofins Analytical Laboratory results shown because 4-MCHM was not detected in any samples analyzed by ALS Environmental Laboratory.

Table 3. Comparison of Tap Water Odor Descriptors, 4-MCHM and Free Chlorine Concentrations

Location and Water Temperature		4-MCHM, ppb	Free Cl_2, ppm	Licorice	Chlorine	Musty	Sweet
Home 1	Kitchen Cold	1 6	2.30	√	√	-	-
	Kitchen Hot	1.2	1.40	√	√	-	-
	Bath Cold	1.5	2.70	√	√	-	-
	Bath Hot*	1.3	1.80	-	-	-	-
Home 2	Kitchen Cold	1.6	2.60	√	√	-	-
	Kitchen Hot	1.1	2.20	-	√	-	-
	Bath Cold	1.2	2.60	-	√	-	-
	Bath Hot	1.1	2.20	-	-	√	-
Home 3	Kitchen Cold	0.9	2.60	-	√	-	-
	Kitchen Hot	2.2	0.20	√	√	-	-
	Bath Cold	1.1	3.00	-	Y	-	-
	Bath Hot*	1.3	1.10	√	-	-	-
Home 4	Kitchen Cold	1.1	2.70	-	√	-	√
	Kitchen Hot	0.9	2.40	-	√	√	-
	Bath Cold	1.0	3.10	-	√	-	-
	Bath Hot	0.7	2 40	-	-	-	-
Home 5	Kitchen Cold	1.1	2.40	-	√	-	√
	Kitchen Hot	0.9	1.80	-	-	-	-
	Bath Cold	1.1	2.80	-	√	-	√
	Bath Hot	0.9	2.00	-	√	-	-
Home 6	Kitchen Cold	1.6	2.70	-	-	-	√
	Kitchen Hot	1.5	1.60	-	-	-	√
	Bath Cold	2.0	2.40	-	-	-	√
	Bath Hot	1.4	1.90	-	-	-	-
Home 7	Kitchen Cold	1 6	2.20	-	√	-	-
	Kitchen Hot	0.7	0.50	-	√	-	√
	Bath Cold	1 8	2.40	-	√	-	-
	Bath Hot	1.1	0.60	-	-	-	-
Home 8	Kitchen Cold	4.5	2.60	-	√	-	-
	Kitchen Hot	6.1	1.90	-	√	-	√
	Bath Cold	2.5	2 70	-	√	-	√
	Bath Hot	4.6	2.00	-	√	-	√
Home 9	Kitchen Cold	0.9	2.80	-	√	-	-
	Kitchen Hot	0.7	1.90	-	√	-	√
	Bath Cold	1.1	3.10	-	√	-	-
	Bath Hot	0.8	2 20	-	-	-	√
Home 10	Kitchen Cold	0.7	2.20	-	√	-	√
	Kitchen Hot	0.5	1.50	-	-	-	√
	Bath Cold	0.7	2.00	-	√	-	-
	Bath Hot	0.5	1.80	-	-	-	√

Results for 4-MCHM data represent the mean of three discrete water samples collected from each location Free chlorine data represent a single measurement at each location before water was collected for 4-MCHM analysis Hyphen (-) indicates odor type was not detected by the tap water sampling team Check mark (√) indicates an odor descriptor of "chemical" was reported by the tap water sampling team

4.0 VALUE OF PARAMETERS MONITORED AND PATH FORWARD

4 1 Important Parameters

Among the water quality parameters assessed in tap water, only MCHM concentration, odor, temperature and chlorine concentration were useful in assessing the impact of the spill on premise plumbing. Any further sampling should be focused on those parameters. MCHM concentration and odor provide direct measures of the impact of the spill and temperature and chlorine concentration have indirect effects because they are related to odor

4-MCHM analysis was valuable and should be included in additional studies. However, it is critically important that laboratories selected can detect and quantify low concentrations of MCHM (e.g., at the Eurofins MDL of 0.5 ppb). As time since the spill elapses, 4-MCHM concentrations are expected to continue declining in the absence of a source in the water treatment facility, distribution system, and/or premise plumbing systems

4 2 Needed Research

This study was designed as a focused residential drinking water sampling field study that supports the design of a larger, more comprehensive characterization for the nine counties affected The study produced sufficient data for design of the larger study, but raised numerous questions regarding tap water chemical and odor quality at affected buildings Those questions are presented below.

4 2.1 Expansive In-Home Tap Water Sampling Study

If an expanded in-home tap water survey were conducted, the following questions could inform the sampling plan.

1. How does water age affect 4-MCHM concentration?
2. What is the variability in 4-MCHM concentration between homes within the same pressure zone?
3. Does the residence time of the tap water in premise plumbing influence the 4-MCHM concentration?
4. Do certain plumbing materials (metals and plastics) affect 4-MCHM concentrations?
5 Are there additional chemicals (either break-down products of MCHM or unrelated compounds) present causing odor?

4 2 2 Continued Source. The purpose of this study was not to identify the source of the 4-MCHM, but to characterize 4-MCHM tap water concentrations across the 10 homes studied The finding that 4-MCHM was present in tap water from all homes studied demonstrates that customers were still being exposed to 4-MCHM contaminated tap water more than 1 month after the incident began The source of ongoing 4-MCHM loading to the distribution system must be determined so as to predict the assets affected and decontamination actions needed 4-MCHM could reside in plumbing systems, the WVAW distribution system, or both

During the initial days of the incident, officials issued a Do Not Use order This order resulted in contaminated water stagnating in place, and the consequences of this stagnation period and

subsequent flushing of contaminated water through the infrastructure remain unknown. It is possible 4-MCHM adsorbed to or permeated into materials within the WVAW water distribution system and premise plumbing systems. Under this scenario, sequestered MCHM could gradually desorb into the drinking water over time and serve as an ongoing source of contamination

Water distribution and premise plumbing systems are complex They are comprised of both metal and plastic water transport components, storage tanks, and hot water heaters. Future studies could include a more detailed investigation into the fate and transport of 4-MCHM and minor components of crude MCHM in premise plumbing and drinking water infrastructure. A number of factors could contribute to detention of MCHM and gradual release from drinking water infrastructure. Corrosion scales on metal pipe surfaces increase the available surface area on which crude MCHM components or breakdown products could adsorb Biofilms are also present in both drinking water distribution pipes and premise plumbing and could absorb contaminants Corrosion scales and biofilms could present a greater problem in premise plumbing systems which have smaller diameter pipes than distribution systems pipes and higher surface area to water volume ratios. Prior studies indicate that certain plastics are penetrated more rapidly by organic chemicals than others Biofilms, pipes, and hot water heaters are all potential in-home sources of crude MCHM components or any breakdown products that were formed

4.2.3 Reevaluation of Decontamination Measures The US EPA defines decontamination as *"the inactivation or reduction of contaminants by physical, chemical or other methods to meet a cleanup goal. Decontamination is a key component of the remediation phase in a contamination incident During a water incident, once contamination and characterization are confirmed, decontamination is performed before returning a system to service"* In accordance with the decontamination cleanup goals established by the State of West Virginia, affected infrastructure and plumbing systems had been decontaminated to a level below the 10 ppb screening level. Despite attainment of this goal, the presence of 4-MCHM at resident taps was objectionable to residents and negatively impacted public perception about their drinking water and their water utility Those factors should be considered in a reassessment of the clean-up goals for this spill.

5.0 CONCLUSION

The purpose of this work was to conduct a focused residential drinking water field study that included a resident survey and tap water testing Ten homes affected by the Crude MCHM Elk River chemical spill were surveyed and sampled in eight of the nine counties affected (Boone, Cabell, Clay, Kanawha, Lincoln, Logan, Putnam, and Roane counties). Upon arrival, tap water was characterized for pH, free and total chlorine concentration, turbidity, and odor at the kitchen sink and bathroom tub faucets. Cold water quality was examined first followed by hot water analysis Water samples were then collected and shipped to two commercial laboratories for determination of TOC, 4-MCHM, and PPH concentrations MRL and MDLs for their respective methods differed for the two laboratories

The only parameters that were tested that appear to contribute any useful information for spill characterization and response are MCHM concentration, odor, temperature, and chlorine concentration. The contaminant 4-MCHM was detected in all 10 homes by Eurofins Analytical Laboratory, but not detected by ALS Environmental Laboratory in replicate water samples This finding is significant and underscores the importance of selecting laboratories that can detect and quantify low concentrations of contaminants during a chemical contamination incident The reason for this difference is likely due to 4-MCHM method MDL differences Eurofins Analytical Laboratory's MDL and

MRL for 4-MHCM were nearly 0 5 ppb and 1 0 ppb while ALS Environmental Laboratory's MRL and MDL values were greater at 2.7 ppb and 5 0 ppb. Ninety percent of the 4-MCHM concentrations reported by Eurofins Analytical Laboratory were less than 2.4 ppb Thus, ALS Environmental Laboratory's method could not detect the low levels of 4-MCHM present in tap water at a 4-MCHM concentration equal to or less than 2 4 ppb. Home #8 had the greatest average 4-MCHM concentration of 4 4 $\pm$ 1 4 ppb, and the maximum observed concentration of 6 1 ppb. No 4-MCHM concentration detected in any home exceeded the 10 ppb State of West Virginia screening level

6.0 ACKNOWLEDGEMENT

Special thanks are extended to the residents who permitted the WV TAP team to enter their homes and test their tap water. These individuals, who will remain anonymous, have done a great service to thousands of West Virginians who were also affected by the spill Appreciation is also extended to ALS Environmental Laboratory and Eurofins Laboratories for their participation.

7.0 REFERENCES

Krasner, S W., and Barrett, S.E , 1984. Aroma and Flavor Characteristics of Free Chlorine and Chloramines *Proceedings AWWA Water Quality Technology Conference*, Denver, Colorado, December 2-5, pp 381-398.

Shaw Environmental, Inc., 2008 *Pilot-Scale Tests and Systems Evaluation for the Containment, Treatment, and Decontamination of Selected Materials From T&E Building Pipe Loop Equipment, EPA/600/R-08/016,* Cincinnati, Ohio USA

US Code of Federal Register (CFR), 1986 *Title 40, Protection of Environment. Chapter 1 Environmental Protection Agency, Subchapter D – Water Programs, Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants* Washington, DC, USA.

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Scully

acqmeth

INSTRUMENT CONTROL PARAMETERS

6890 GC METHOD

OVEN
Initial temp: 75 'C (On)
Initial time: 6.00 min
Ramps:

#	Rate	Final temp	Final time
1	15.00	135	0.00
2	20.00	250	1.00
3	0.0(off)		

Post temp: 0 'C
Post time: 0.00 min
Run time: 16.75 min

Maximum temp: 325 'C
Equilibration time: 0.20 min

FRONT INLET (SPLIT/SPLITLESS)
Mode: Splitless
Initial temp: 200 'C (off)
Pressure: 18.94 psi (On)
Purge flow: 100.0 mL/min
Purge time: 0.20 min
Total flow: 103.9 mL/min
Gas saver: Off
Gas type: Helium

BACK INLET (UNKNOWN)

COLUMN 1
Capillary Column
Model Number: Restek 12623
RTX-5 30mx0.25x0.25
Max temperature: 350 'C
Nominal length: 30.0 m
Nominal diameter: 250.00 um
Nominal film thickness: 0.25 um
Mode: constant flow
Initial flow: 2.0 mL/min
Nominal init pressure: 18.95 psi
Average velocity: 52 cm/sec
Inlet: Front Inlet
Outlet: MSD
Outlet pressure: vacuum

COLUMN 2
(not installed)

Ex. 5 - Deliberative

FRONT DETECTOR ()

SIGNAL 1
Data rate: 20 Hz
Type: test plot
Save Data: Off
Zero: 0.0 (Off)
Range: 0
Fast Peaks: off
Attenuation: 0

BACK DETECTOR ()

SIGNAL 2
Data rate: 20 Hz
Type: test plot
Save Data: Off
Zero: 0.0 (Off)
Range: 0
Fast Peaks: Off
Attenuation: 0

COLUMN COMP 1
(No Detectors Installed)

COLUMN COMP 2
(No Detectors Installed)

THERMAL AUX 2
Use: MSD Transfer Line Heater

acqmeth

Description:
Initial temp: 250 'C (On)
Initial time: 0.00 min
Rate Final temp Final time
1 0.0(Off)

POST RUN
Post Time: 0.00 min

TIME TABLE
Time Specifier Parameter & Setpoint

7673 Injector

Front Injector:

Sample Washes	0
Sample Pumps	3
Injection Volume	1.0 microliters
Syringe Size	10.0 microliters
PostInj Solvent A Washes	7
PostInj Solvent B Washes	6
Viscosity Delay	0 seconds
Plunger Speed	Fast
PreInjection Dwell	0.00 minutes
PostInjection Dwell	0.00 minutes

Back Injector:
No parameters specified

Column 1 Inventory Number : 987224
Column 2 Inventory Number :

MS ACQUISITION PARAMETERS

General Information

Tune File : atune.u
Acquistion Mode : SIM

MS Information

Solvent Delay : 3.00 min

EM Absolute : False
EM Offset : 200
Resulting EM Voltage : 1776.5

[Sim Parameters]

GROUP 1
Group ID : 1
Resolution : Low
Plot 1 Ion : 97.0
Ions/Dwell In Group : (Mass, Dwell) (Mass, Dwell) (Mass, Dwell)
(81.0, 100) (95.0, 100) (97.0, 100)
(110.0, 100)

[MSZones]

MS Quad	: 150 C	maximum 200 C
MS Source	: 230 C	maximum 250 C

END OF MS ACQUISITION PARAMETERS

TUNE PARAMETERS

EMISSION	:	34.610
ENERGY	:	69.922
REPELLER	:	22.081
IONFOCUS	:	90.157
ENTRANCE_LE	:	18.500
EMVOLTS	:	1576.471
AMUGAIN	:	2427.000
AMUOFFSET	:	122.000
FILAMENT	:	1.000
DCPOLARITY	:	0.000
ENTLENSOFFS	:	18.824
MASSGAIN	:	14.000
MASSOFFSET	:	-9.000

END OF TUNE PARAMETERS

END OF INSTRUMENT CONTROL PARAMETERS

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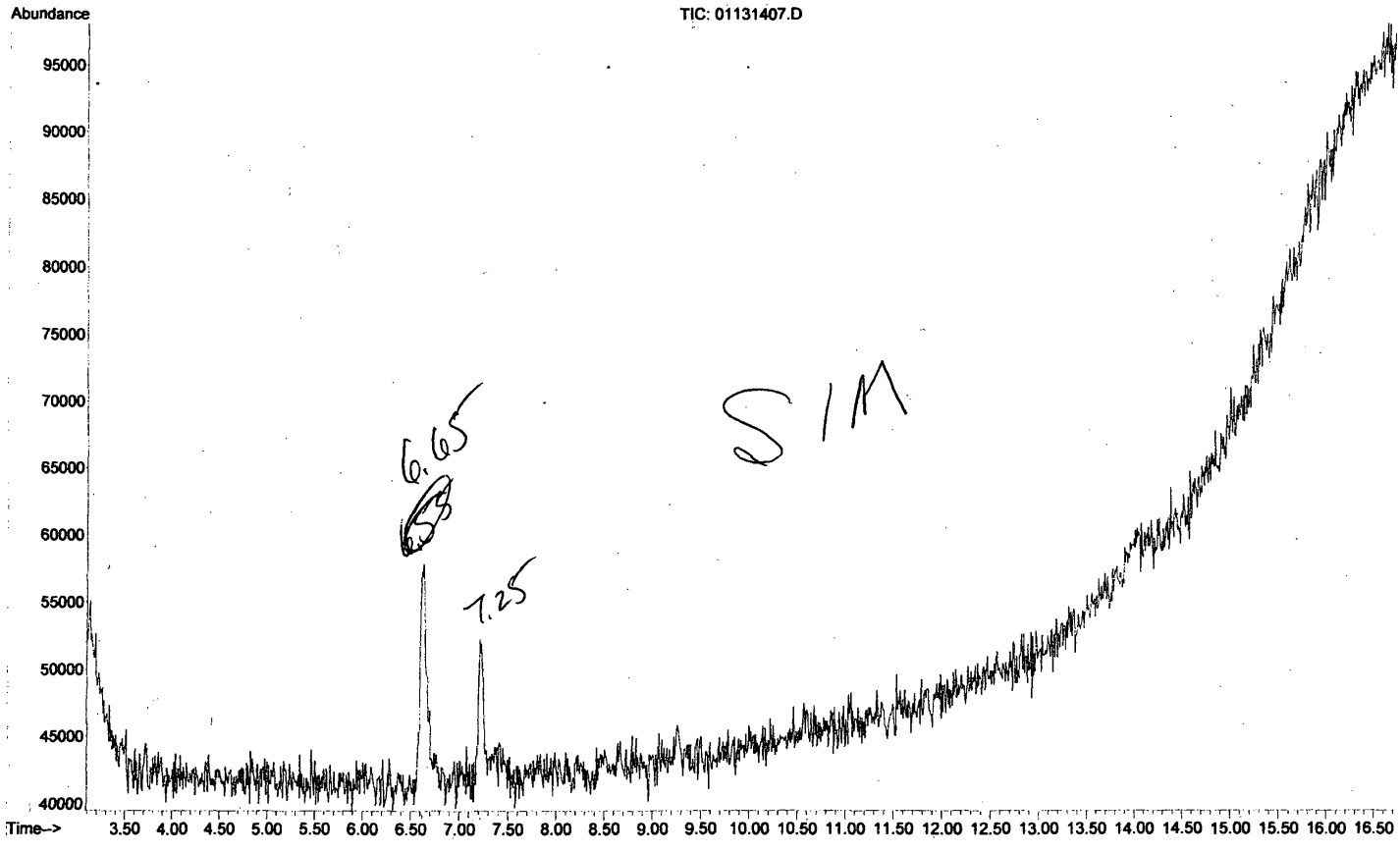

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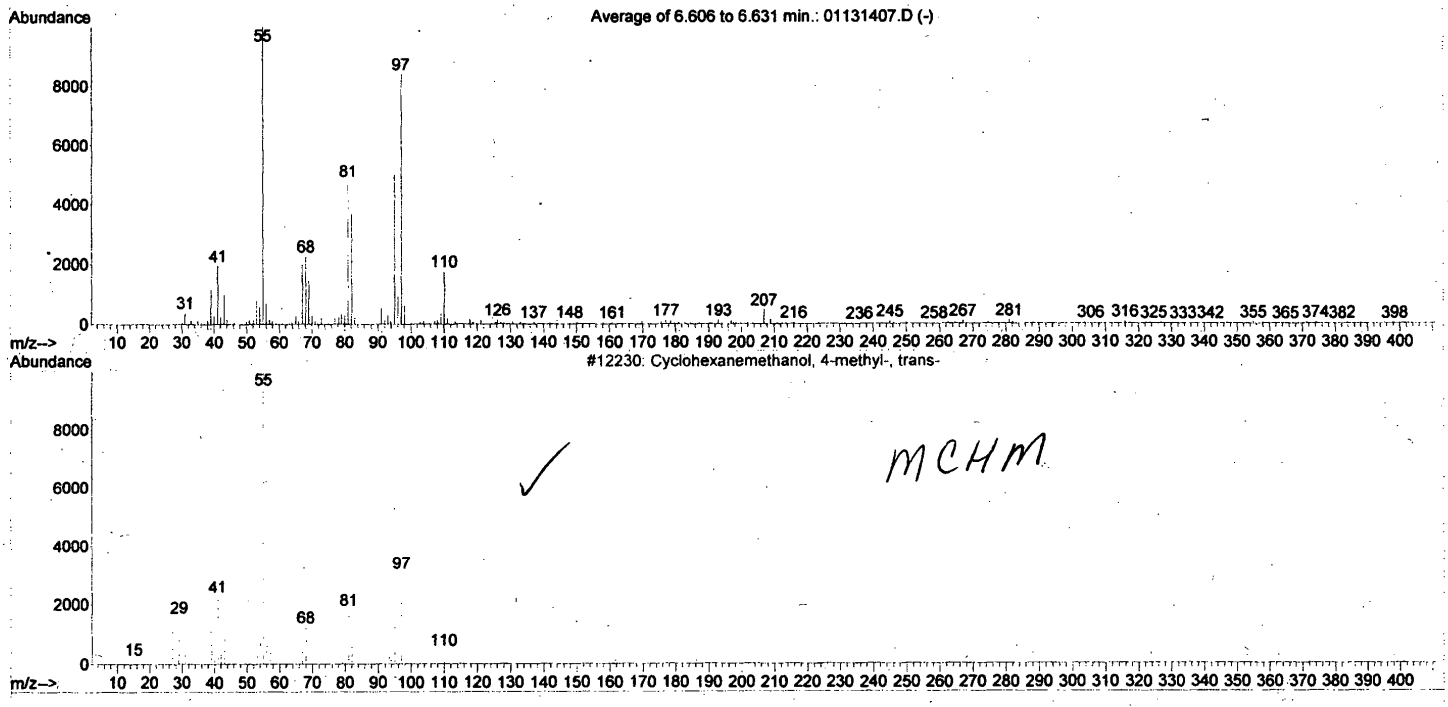

MCHM

OH

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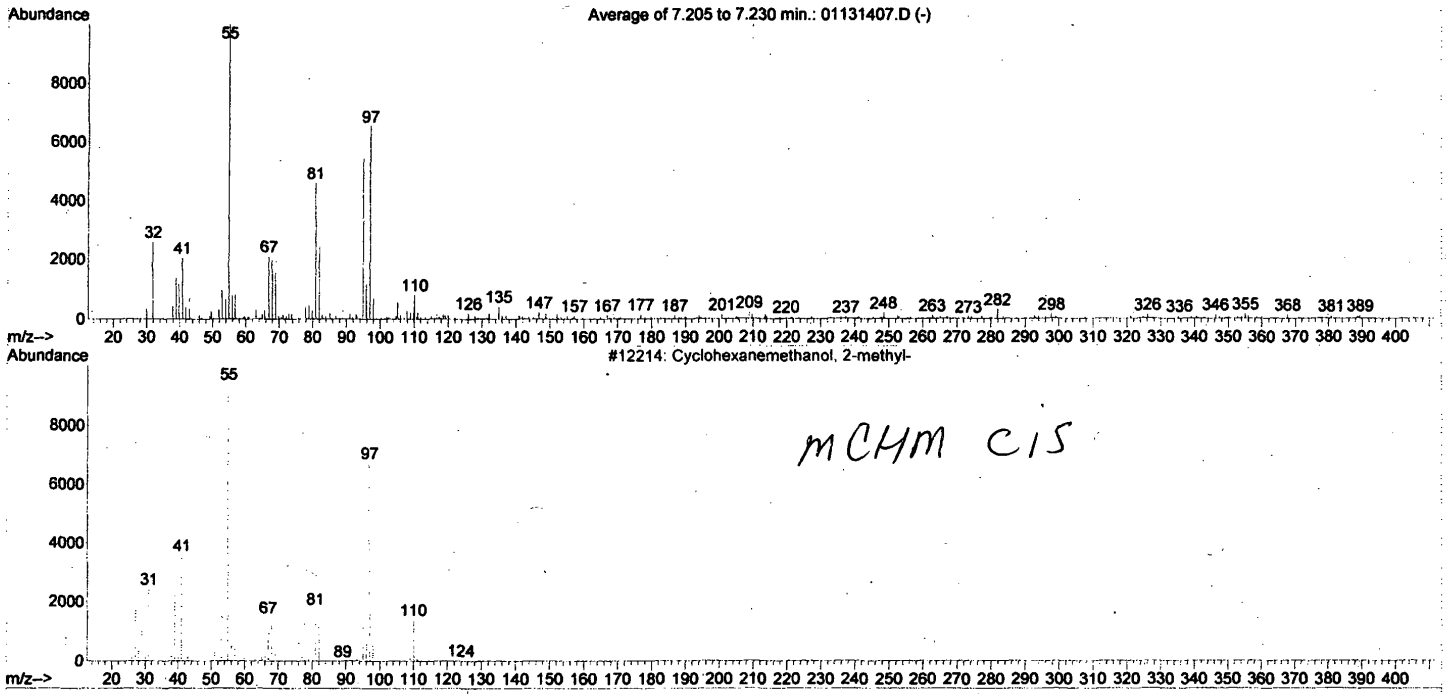

mCHM C15

OH

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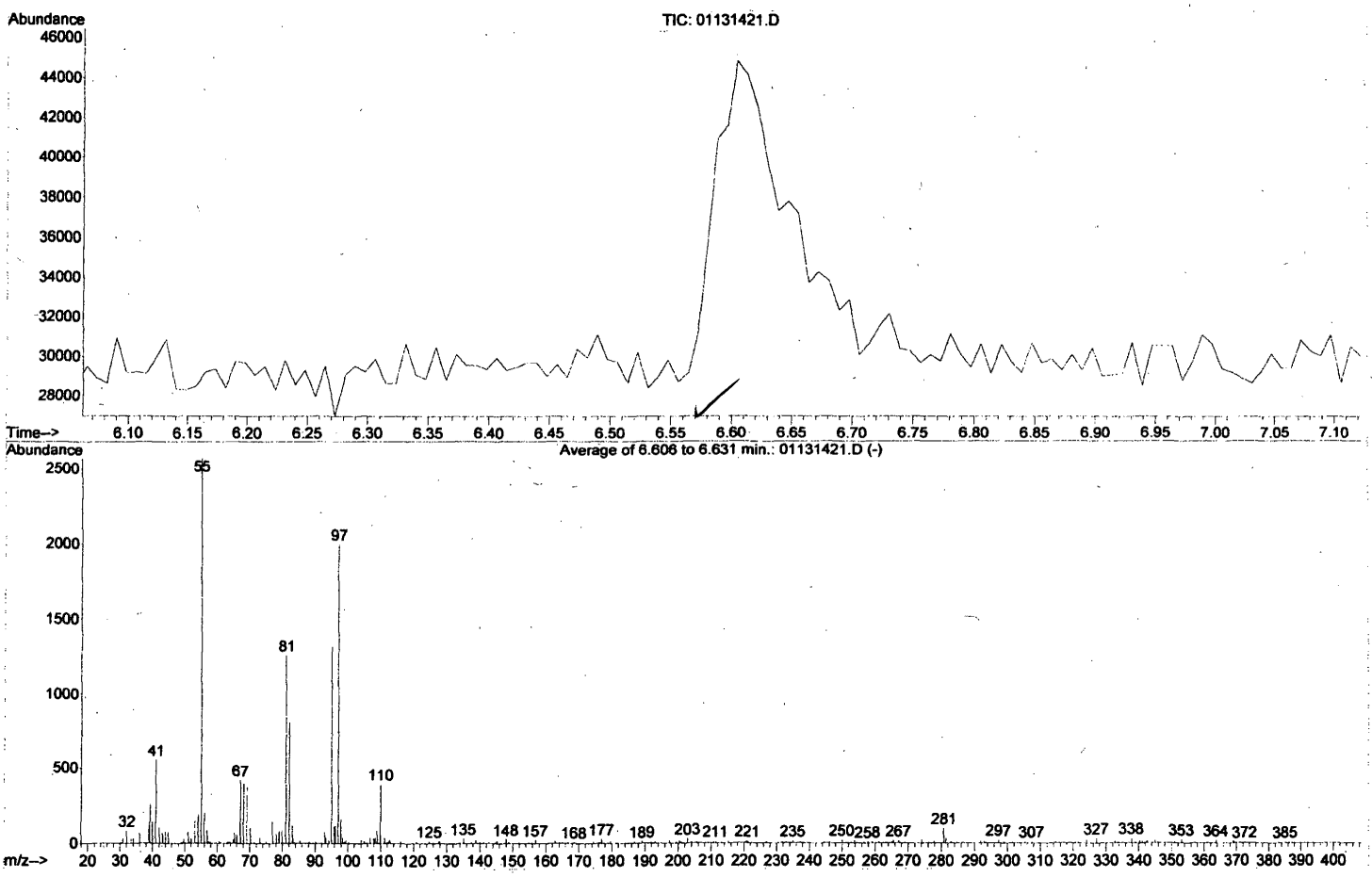

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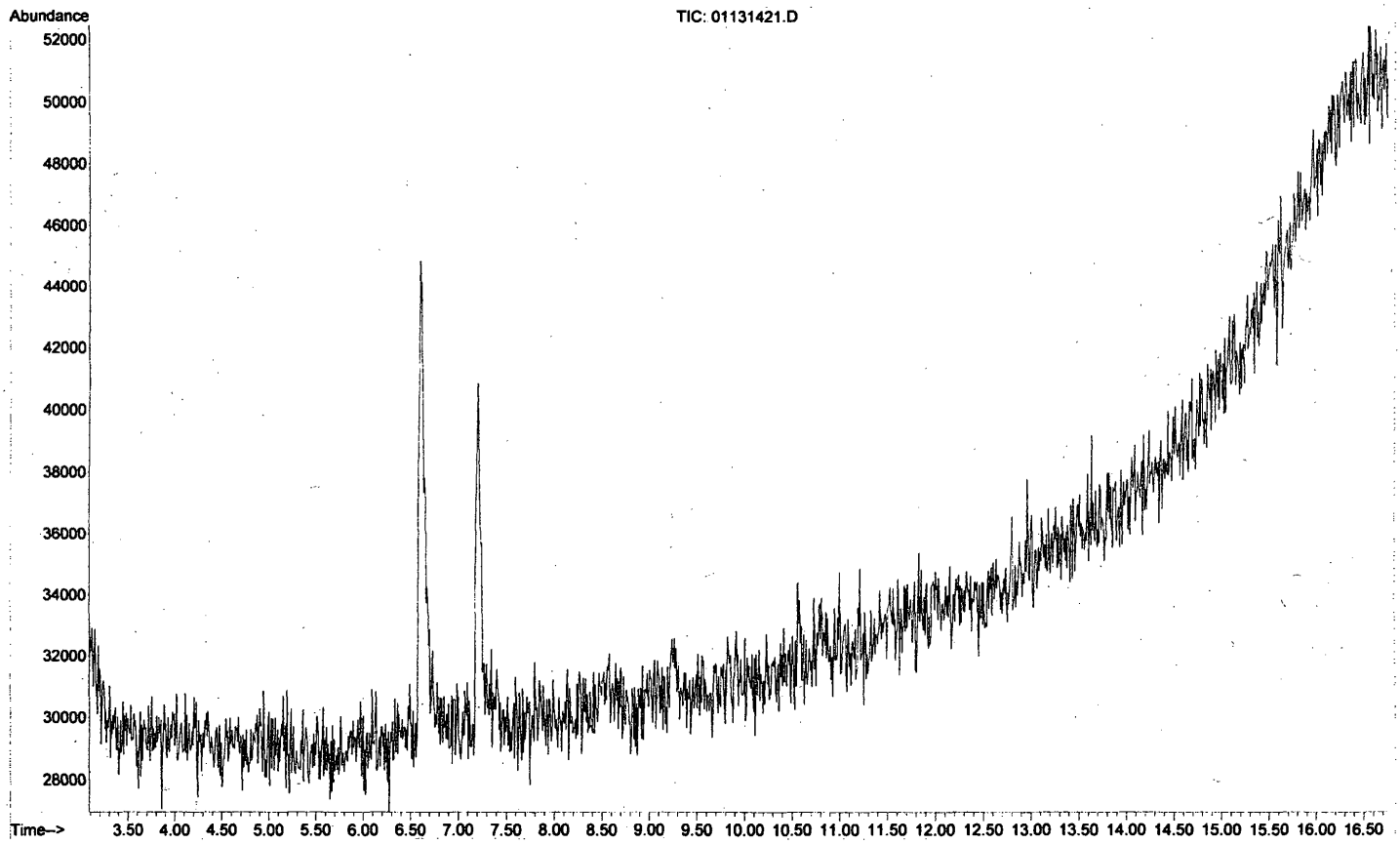

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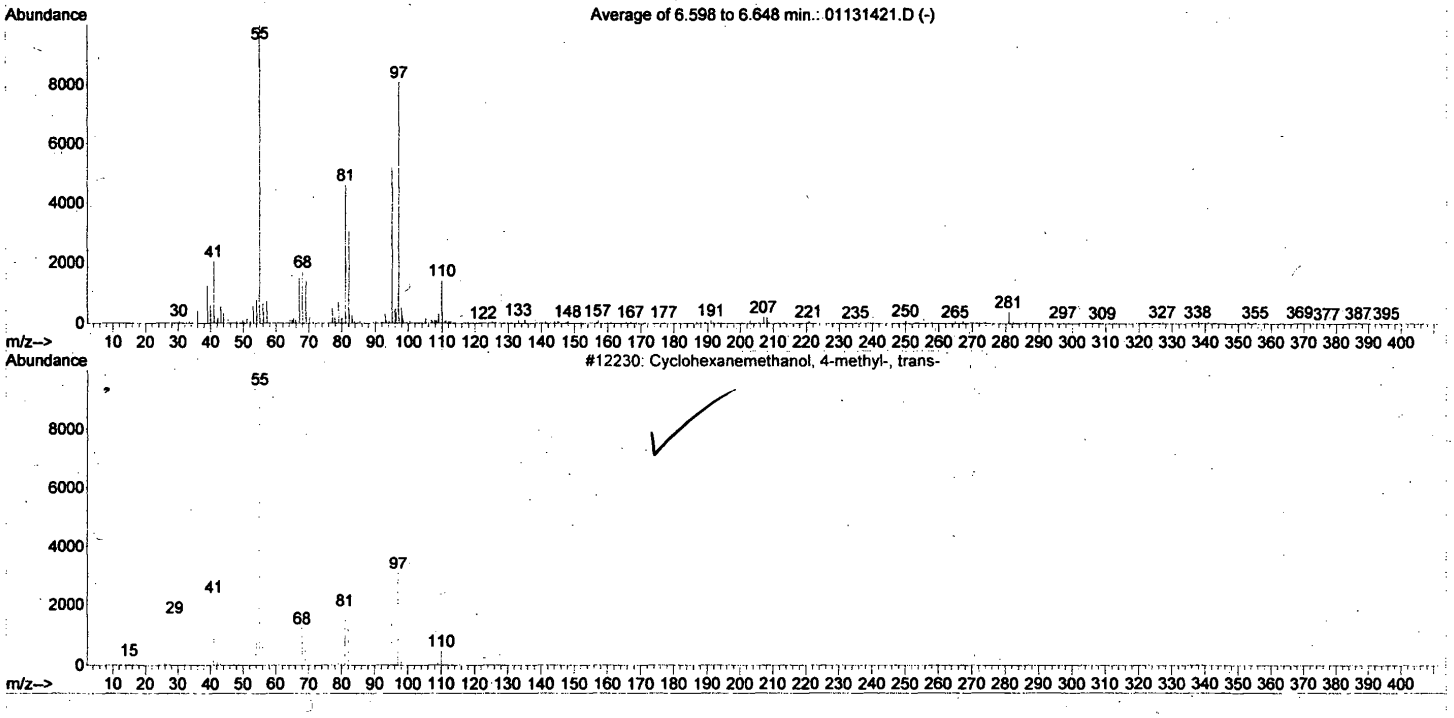

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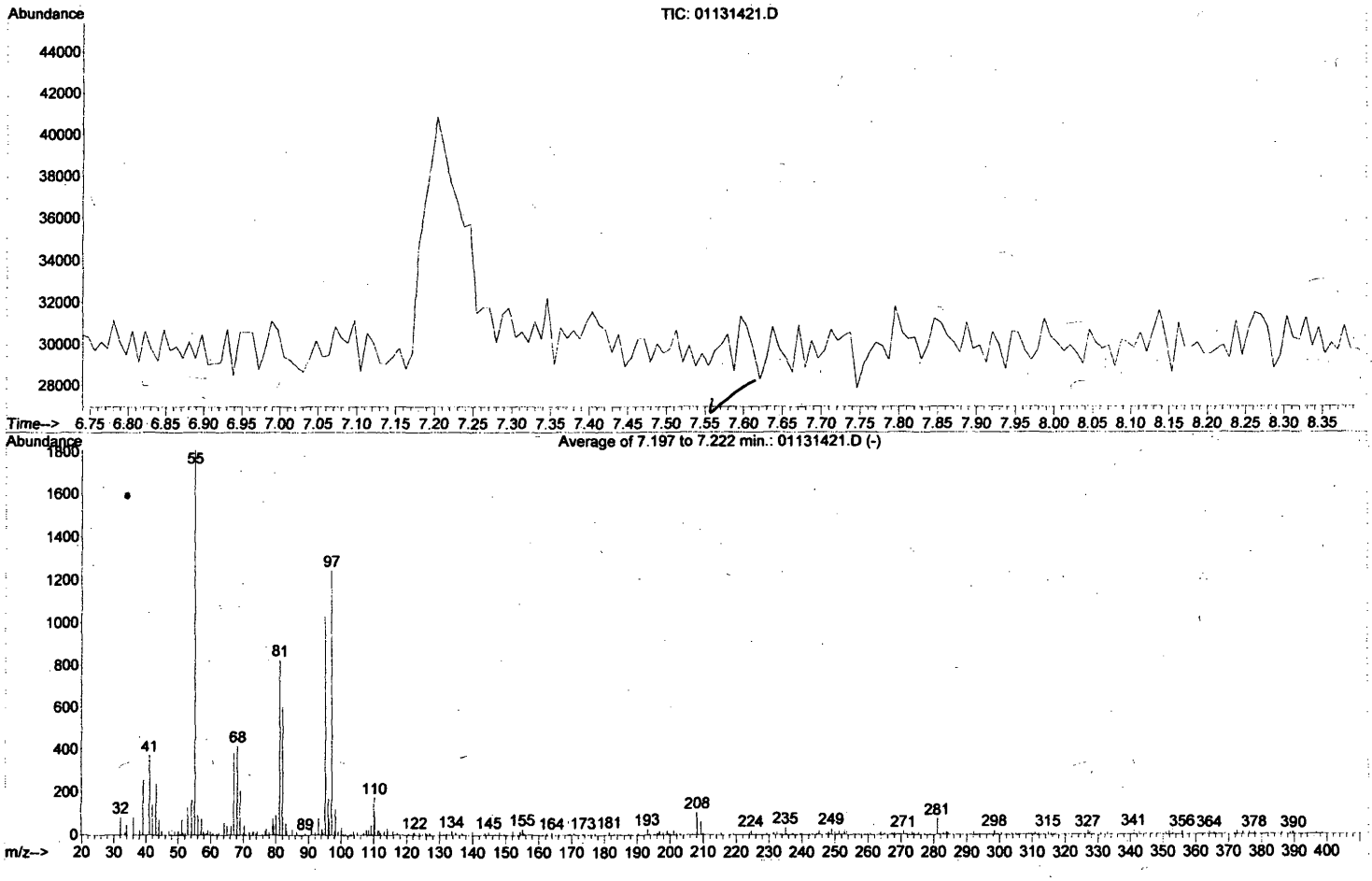

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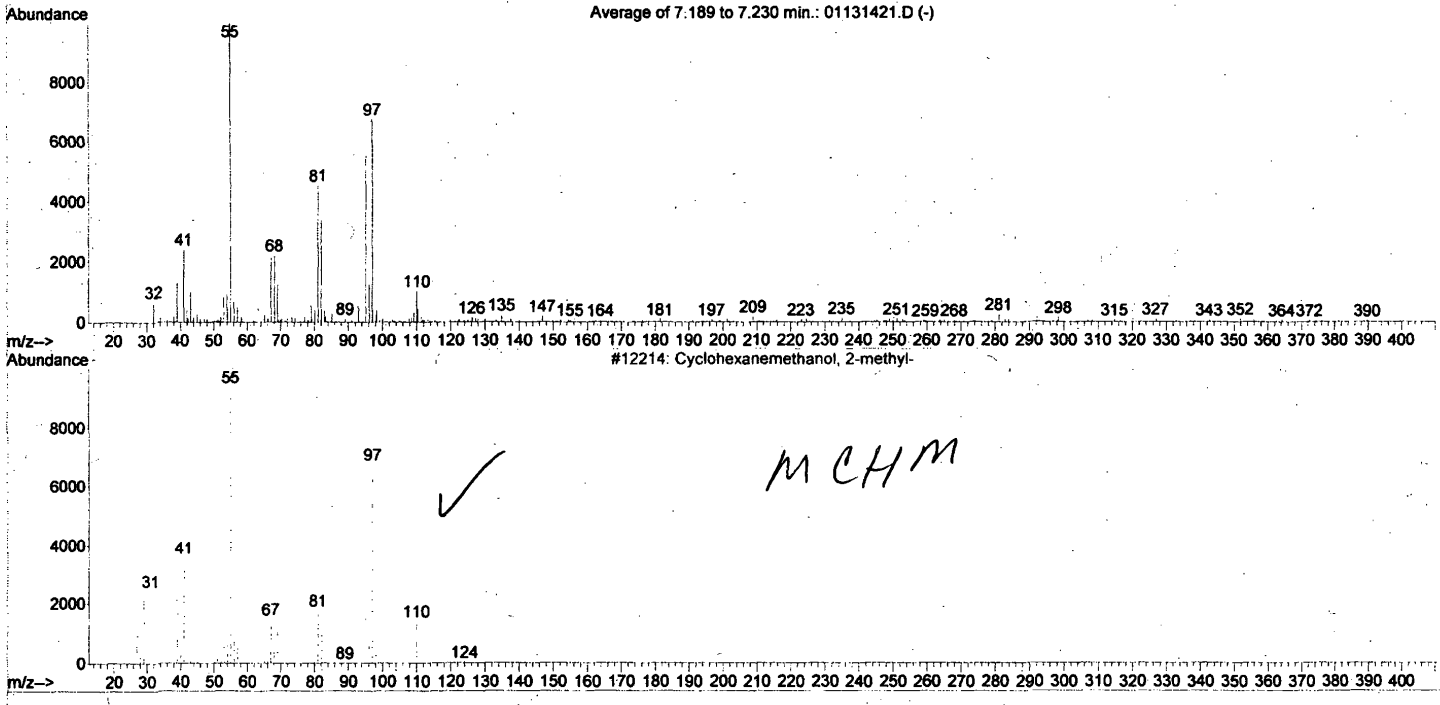

MCHM

OH

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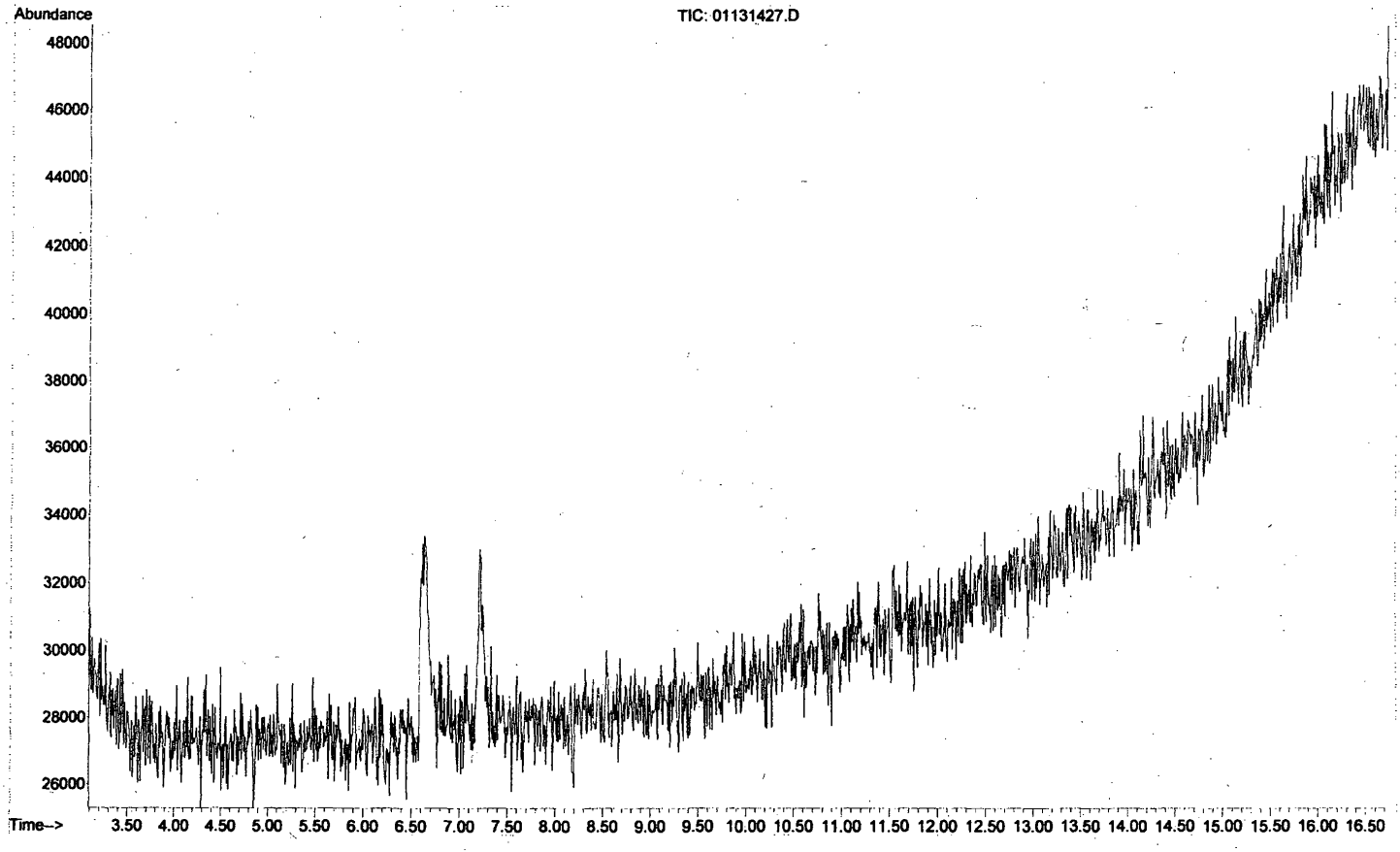

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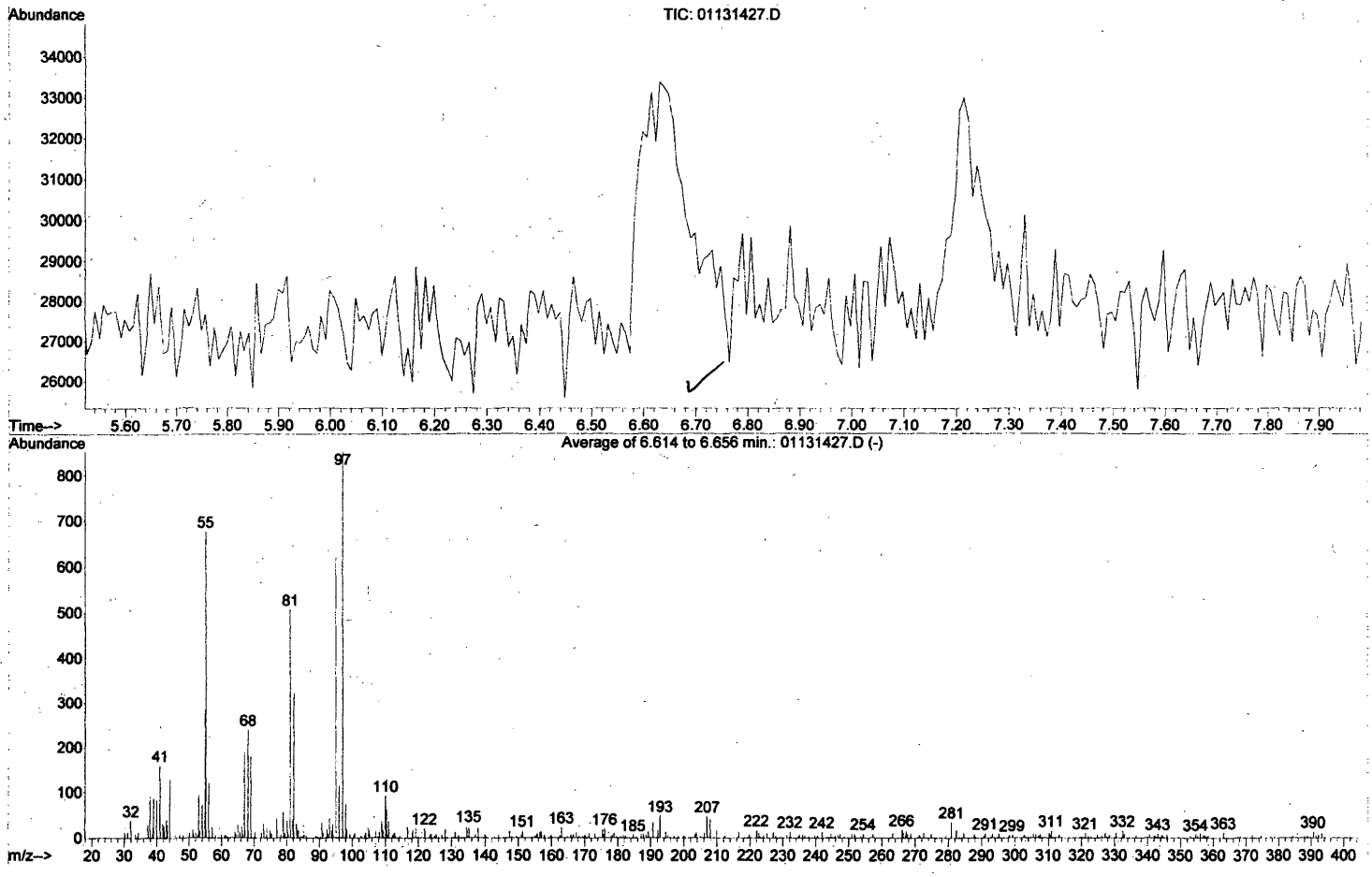

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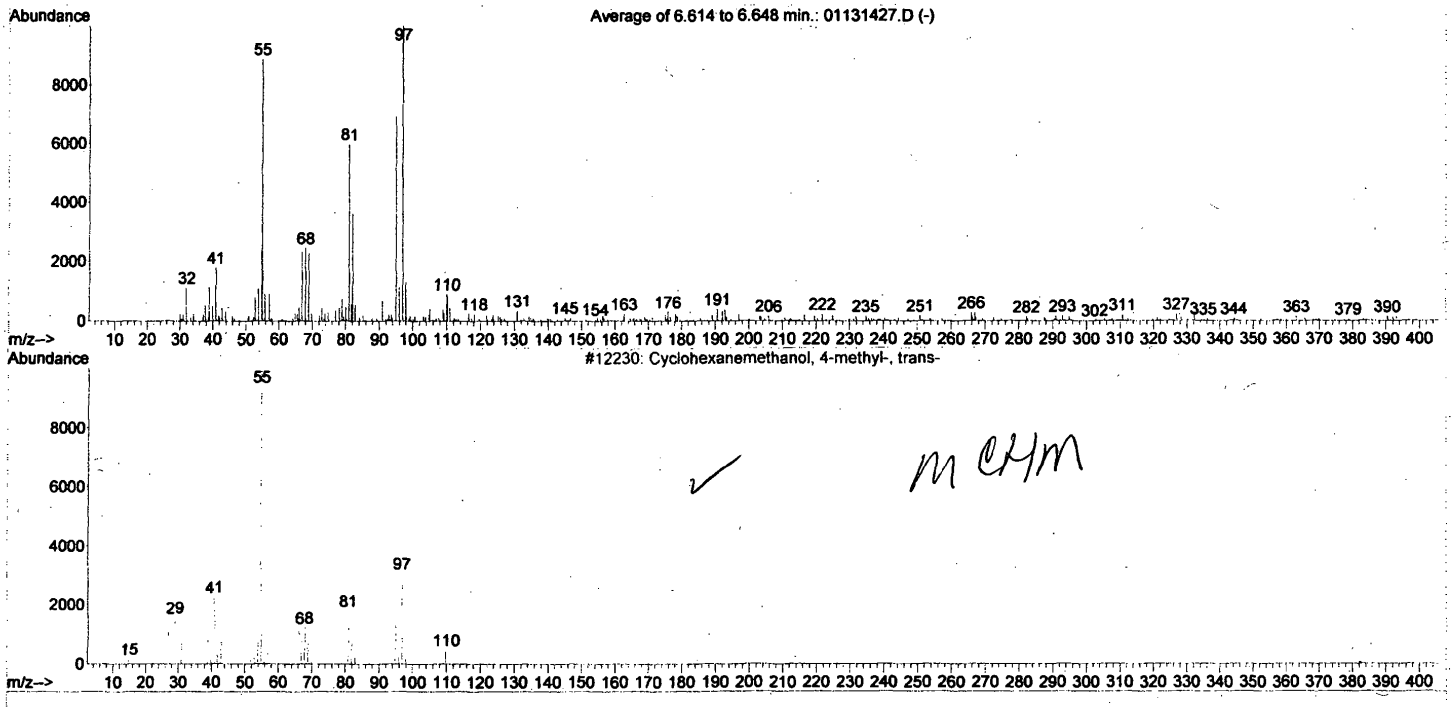

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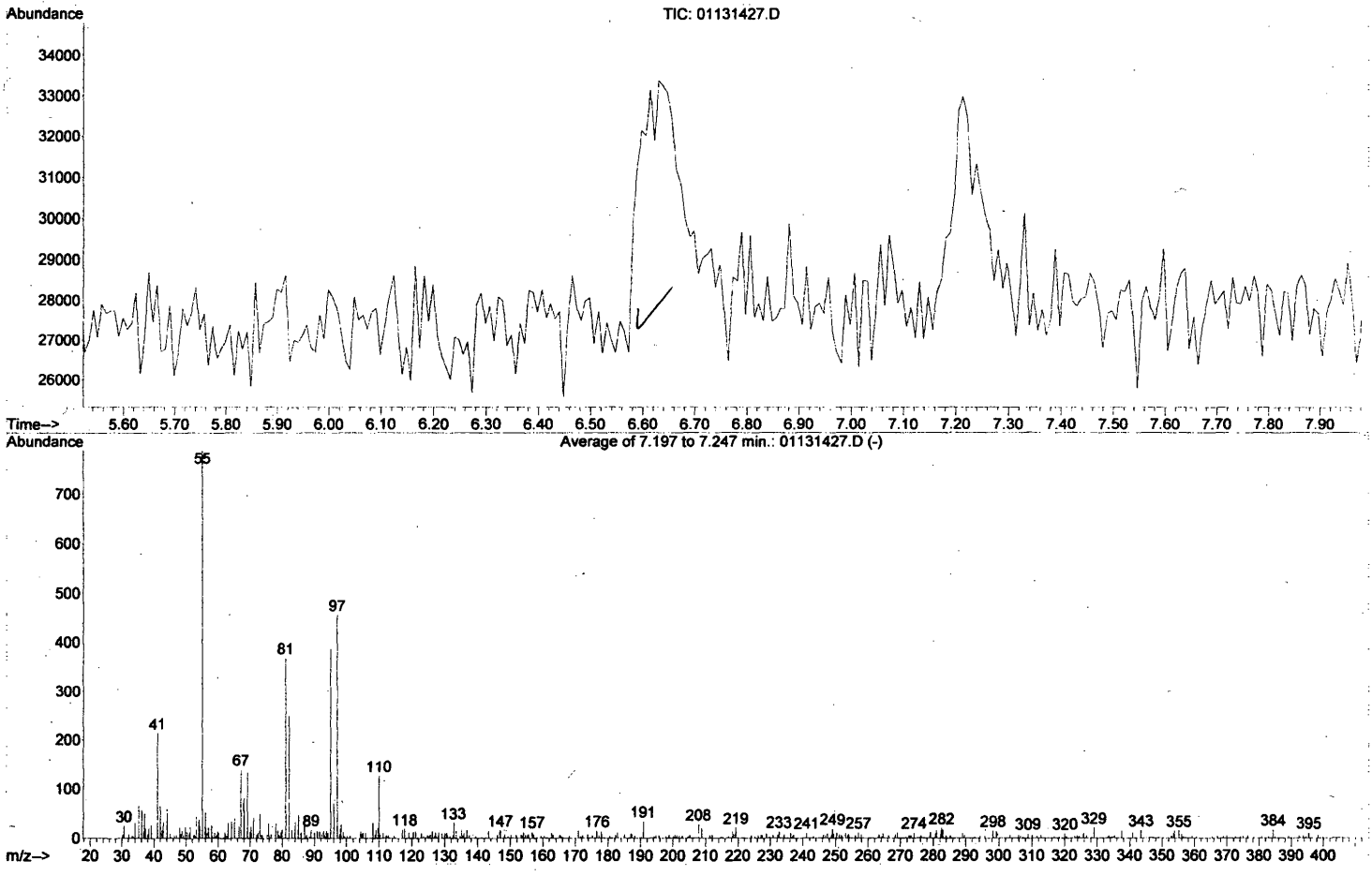
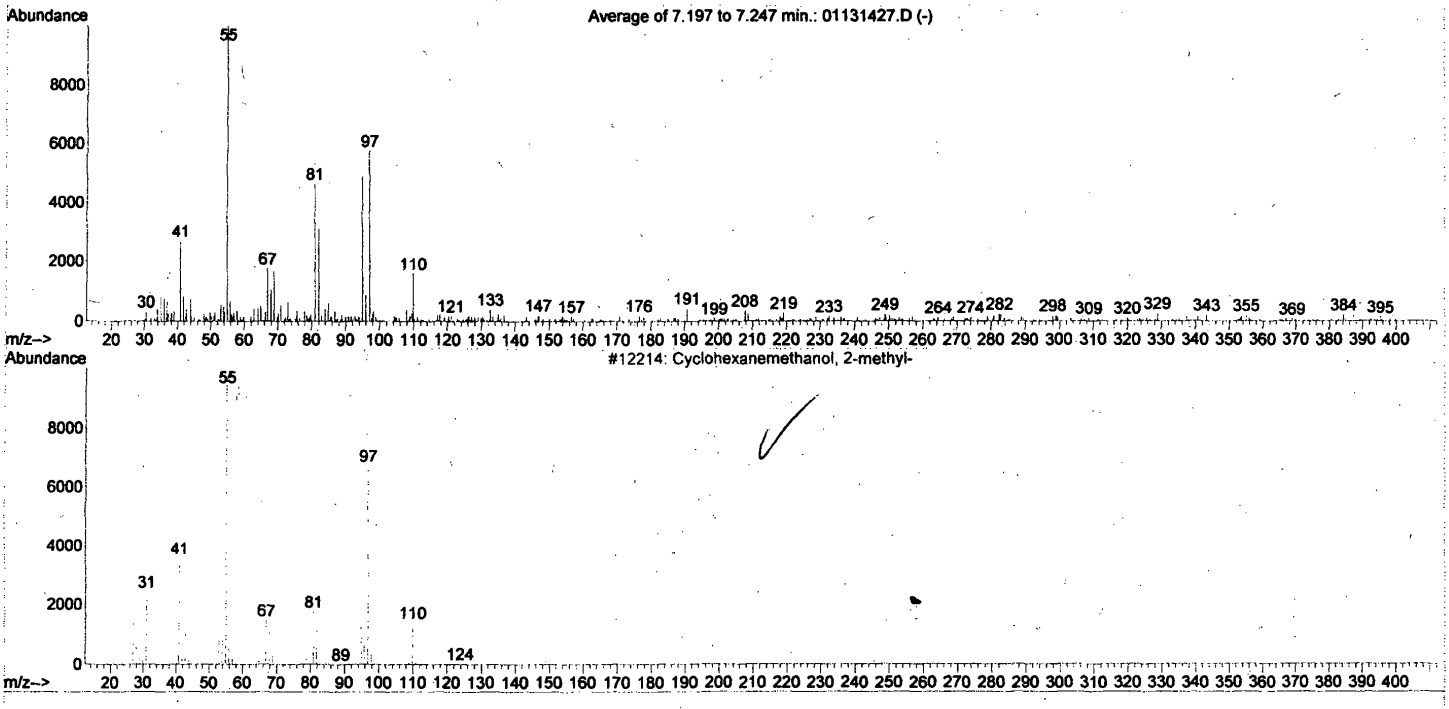
Sample Name: 2345
Misc Info :
Vial Number: 19



Library Searched : C:\Database\NIST02.L
Quality : 22
ID : Cyclohexanemethanol, 2-methyl-



Snoopy

TOPLEVEL PARAMETERS

Method Information For: D:\MSDCHEM\1\METHODS\WV SHORT SCAN.M
Method Sections To Run:

( ) Save Copy of Method With Data
( ) MSTOP Pre-Run Cmd/Macro =
( ) Instrument Control Pre-Run Cmd/Macro =
( ) Data Analysis Pre-Run Cmd/Macro =
(X) Data Acquisition
( ) Data Analysis
( ) MSTOP Post-Run Cmd/Macro =
( ) Instrument Control Post-Run Cmd/Macro =
( ) Data Analysis Post-Run Cmd/Macro =

Method Comments:
Snoopy

END OF TOPLEVEL PARAMETERS

Ex. 5 - Deliberative

INSTRUMENT CONTROL PARAMETERS

6890 GC METHOD

OVEN
Initial temp: 75 'C (On)
Initial time: 6.00 min
Ramps:

#	Rate	Final temp	Final time
1	15.00	135	0.00
2	20.00	250	1.00
3	0.0	(Off)	

Post temp: 0 'C
Post time: 0.00 min
Run time: 16.75 min
Maximum temp: 330 'C
Equilibration time: 1.00 min

FRONT INLET (SPLIT/SPLITLESS)
Mode: Splitless
Initial temp: 200 'C (On)
Pressure: 18.94 psi (On)
Purge flow: 100.0 mL/min
Purge time: 0.20 min
Total flow: 105.0 mL/min
Gas saver: Off
Gas type: Helium

BACK INLET (COOL ON COLUMN)
Mode: Oven track
Pressure: 0.00 psi (Off)
Gas type: Helium

COLUMN 1
Capillary Column
Model Number: restek 12623
5% phenyl
Max temperature: 330 'C
Nominal length: 29.0 m
Nominal diameter: 250.00 um
Nominal film thickness: 0.25 um
Mode: constant flow
Initial flow: 2.0 mL/min
Nominal init pressure: 18.38 psi
Average velocity: 53 cm/sec
Inlet: Front Inlet
Outlet: MSD
Outlet pressure: vacuum

COLUMN 2
(not installed)

Method: WV SHORT SCAN.M

FRONT DETECTOR ()

SIGNAL 1
Data rate: 5 Hz
Type: test plot
Save Data: Off
Zero: 0.0 (Off)
Range: 0
Fast Peaks: Off
Attenuation: 0

COLUMN COMP 1
(No Detectors Installed)

THERMAL AUX 1
Use: MSD Transfer Line Heater
Description:
Initial temp: 300 'C (On)
Initial time: 0.00 min

#	Rate	Final temp	Final time
1	0.0(Off)		

BACK DETECTOR ()

SIGNAL 2
Data rate: 5 Hz
Type: test plot
Save Data: Off
Zero: 0.0 (Off)
Range: 0
Fast Peaks: Off
Attenuation: 0

COLUMN COMP 2
(No Detectors Installed)

POST RUN
Post Time: 0.00 min

TIME TABLE

Time	Specifier	Parameter & Setpoint

7673 Injector

Front Injector:

Sample Washes	0	
Sample Pumps	3	
Injection Volume	1.0	microliters
Syringe Size	10.0	microliters
PostInj Solvent A Washes	7	
PostInj Solvent B Washes	6	
Viscosity Delay	0	seconds
Plunger Speed	Fast	
PreInjection Dwell	0.00	minutes
PostInjection Dwell	0.00	minutes

Back Injector:
No parameters specified

Column 1 Inventory Number : 5
Column 2 Inventory Number :

MS ACQUISITION PARAMETERS

General Information
------- -----------

Tune File : atune.u
Acquistion Mode : Scan

MS Information
-- -----------

Solvent Delay : 3.00 min

EM Absolute : False
EM Offset : 94
Resulting EM Voltage : 1294.1

[Scan Parameters]

Method: WV SHORT SCAN M

Low Mass : 50.0
High Mass : 175.0
Threshold : 75
Sample # : 4 A/D Samples 16

[MSZones]

Quad : 150 C maximum 200 C
Source : 230 C maximum 250 C

END OF MS ACQUISITION PARAMETERS

END OF INSTRUMENT CONTROL PARAMETERS

DATA ANALYSIS PARAMETERS

Method Name: D:\MSDCHEM\1\METHODS\WV SHORT SCAN.M

Percent Report Settings

Sort By: Signal

Output Destination
Screen: No
Printer: Yes
File: No

Integration Events: AutoIntegrate

Generate Report During Run Method: No

Signal Correlation Window: 0.020

Qualitative Report Settings

Peak Location of Unknown: Apex

Library to Search	Minimum Quality
D:\Database\NIST02.L	0

Integration Events: AutoIntegrate

Report Type: Summary

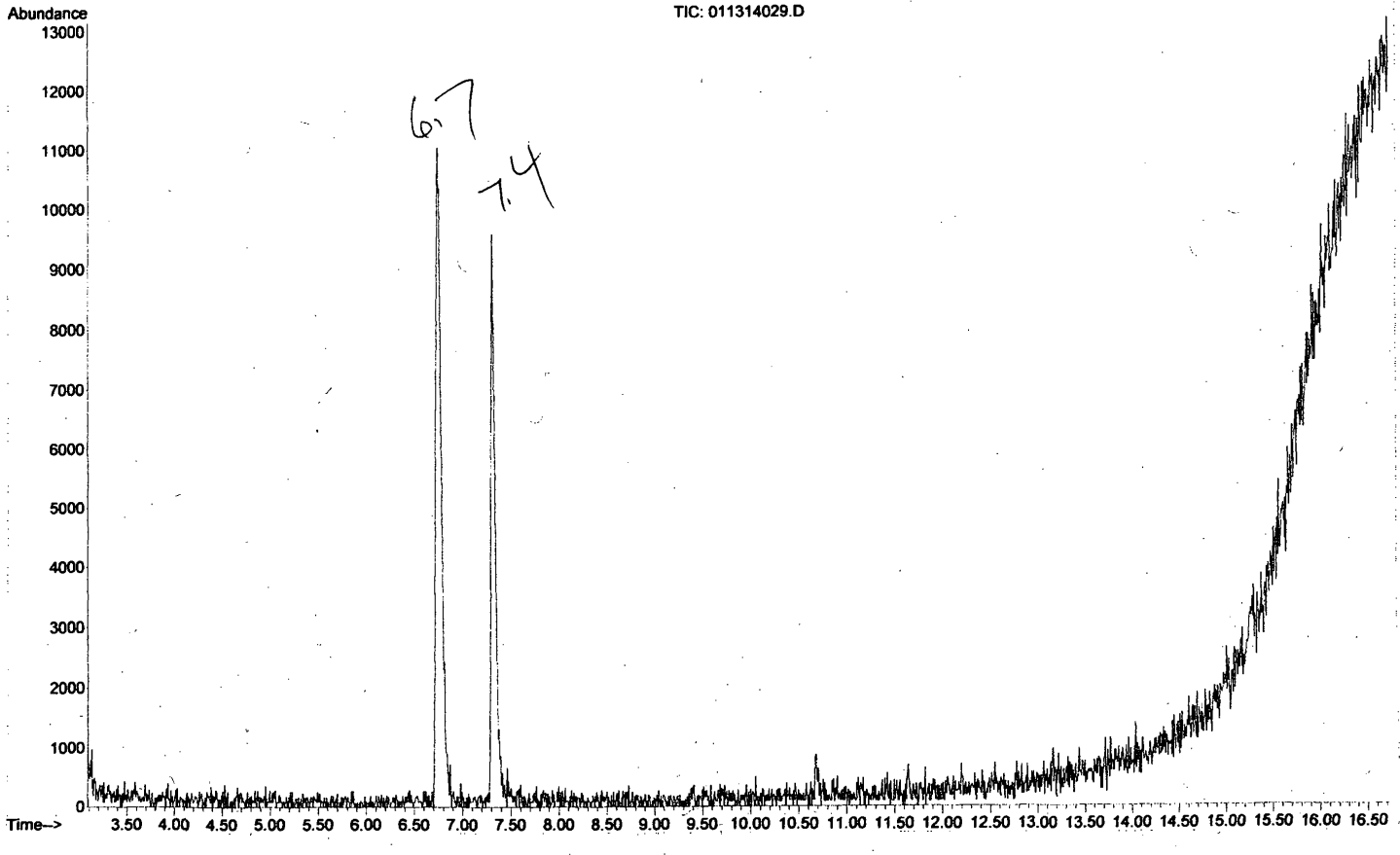
Output Destination
Screen: No
Printer: Yes
File: No

Generate Report During Run Method: No

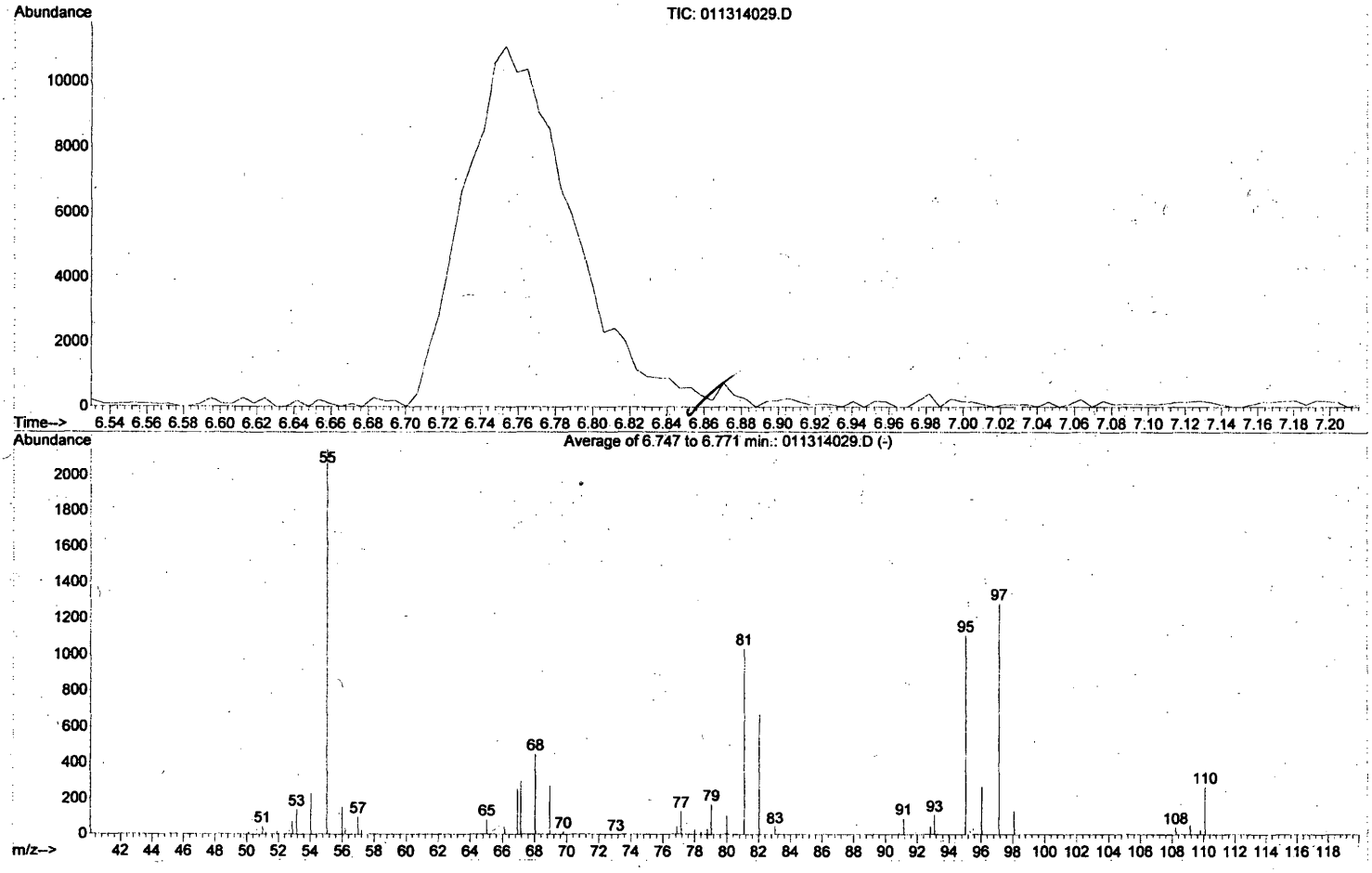
Quantitative Report Settings

Method: WV SHORT SCAN

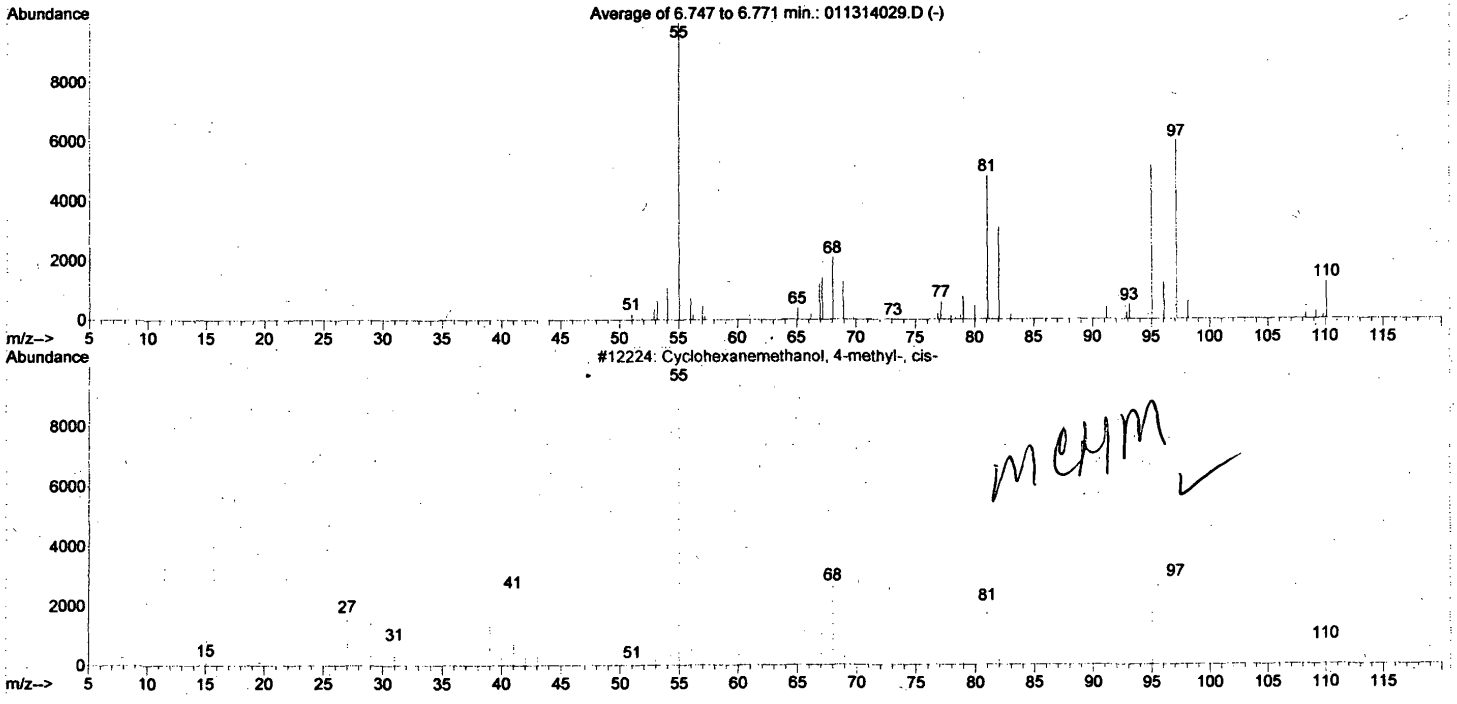
File :D:\MSDChem\1\DATA\WV\011314029.D
Operator : NTB
Acquired : 14 Jan 2014 5:08 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 1325
Misc Info :
Vial Number: 21



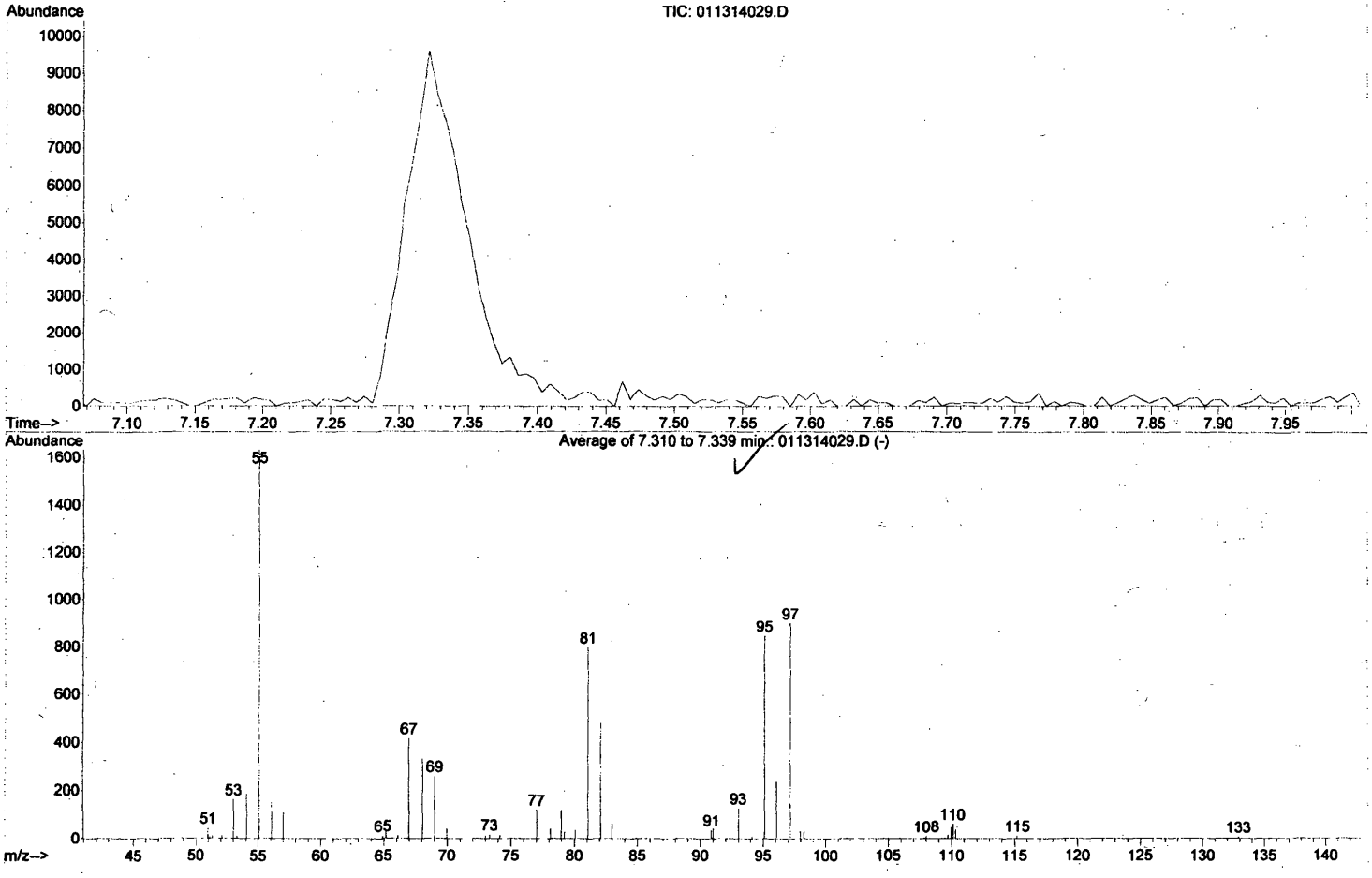
File :D:\MSDChem\1\DATA\WV\011314029.D
Operator : NTB
Acquired : 14 Jan 2014 5:08 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 1325
Misc Info :
Vial Number: 21



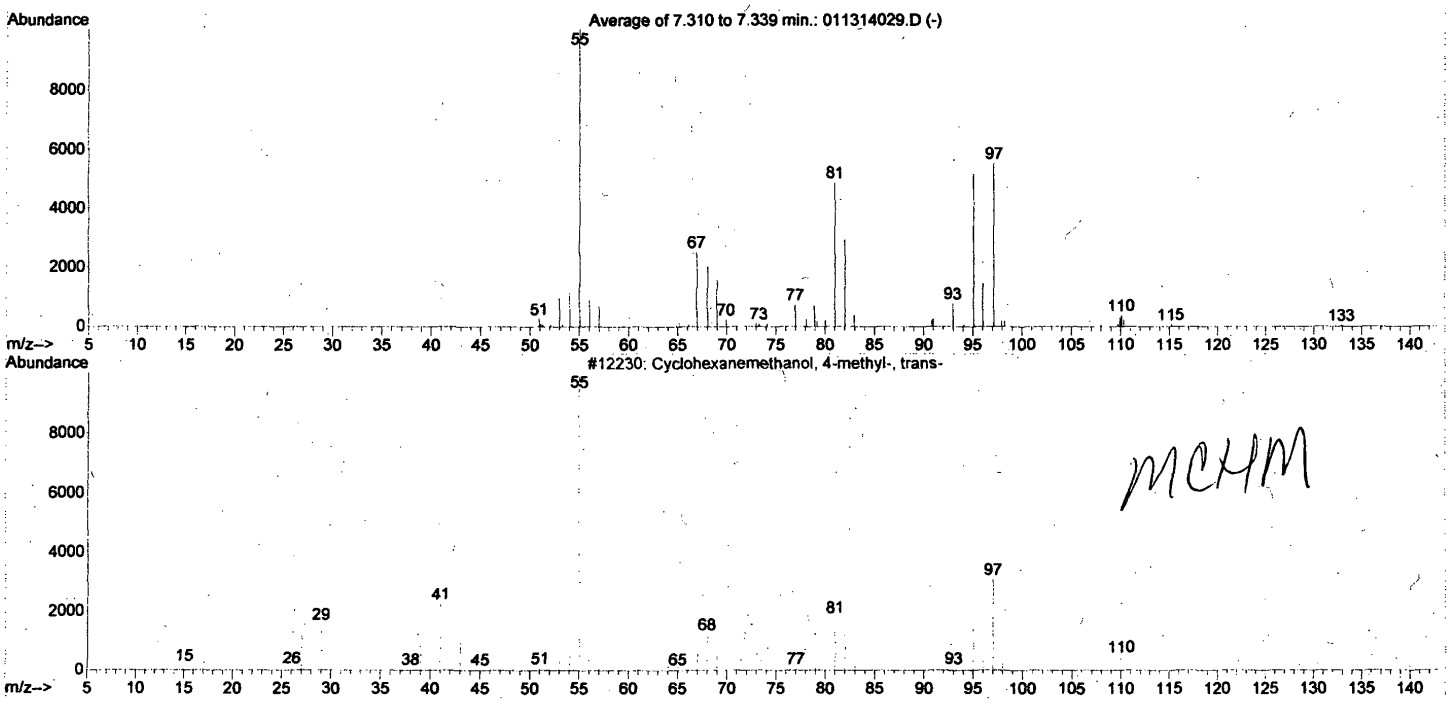
Library Searched : D:\Database\NIST02.L
Quality : 59
ID : Cyclohexanemethanol, 4-methyl-, cis-



File :D:\MSDChem\1\DATA\WV\011314029.D
Operator : NTB
Acquired : 14 Jan 2014 5:08 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 1325
Misc Info :
Vial Number: 21

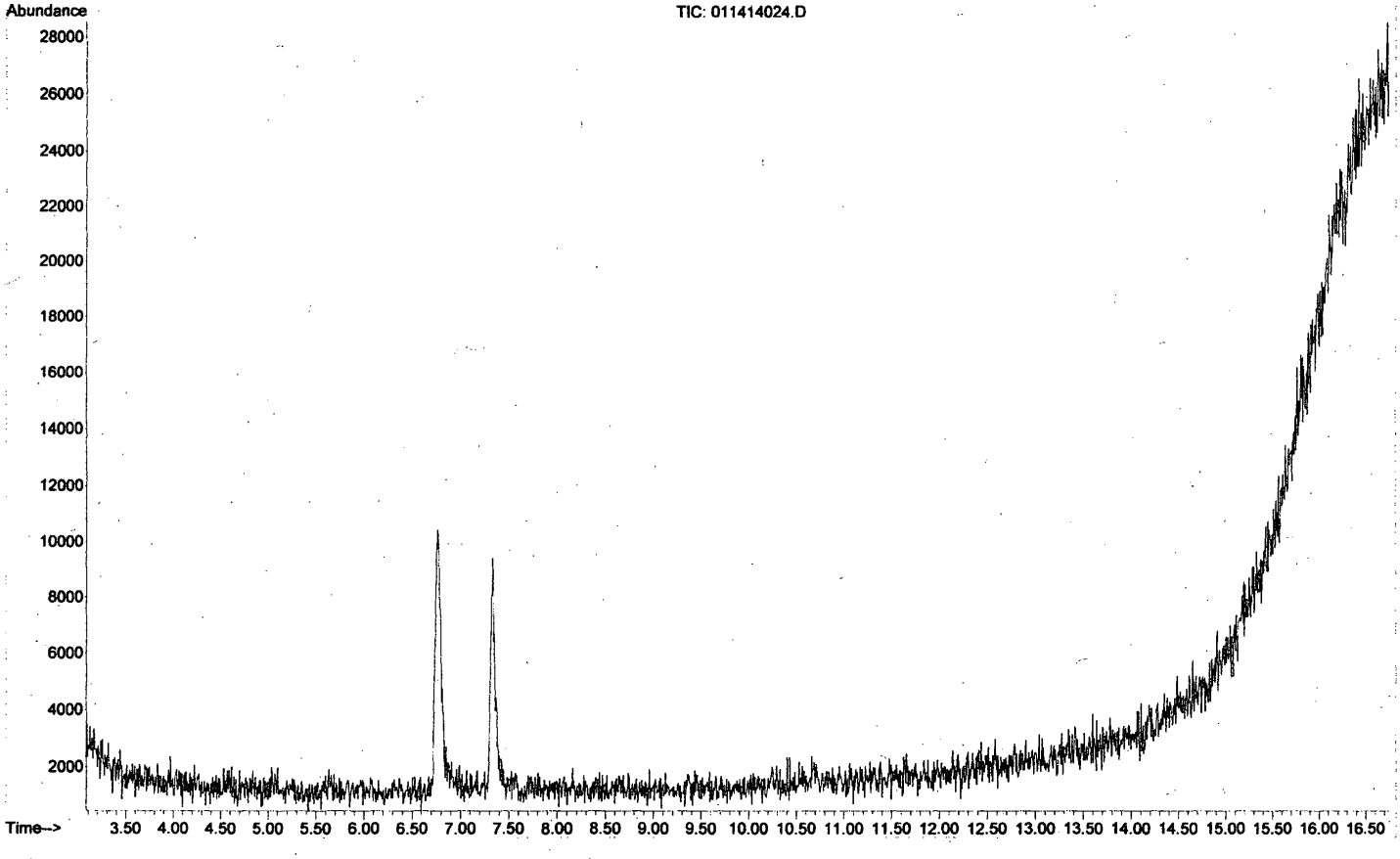


Library Searched : D:\Database\NIST02.L
Quality : 53
ID : Cyclohexanemethanol, 4-methyl-, trans-

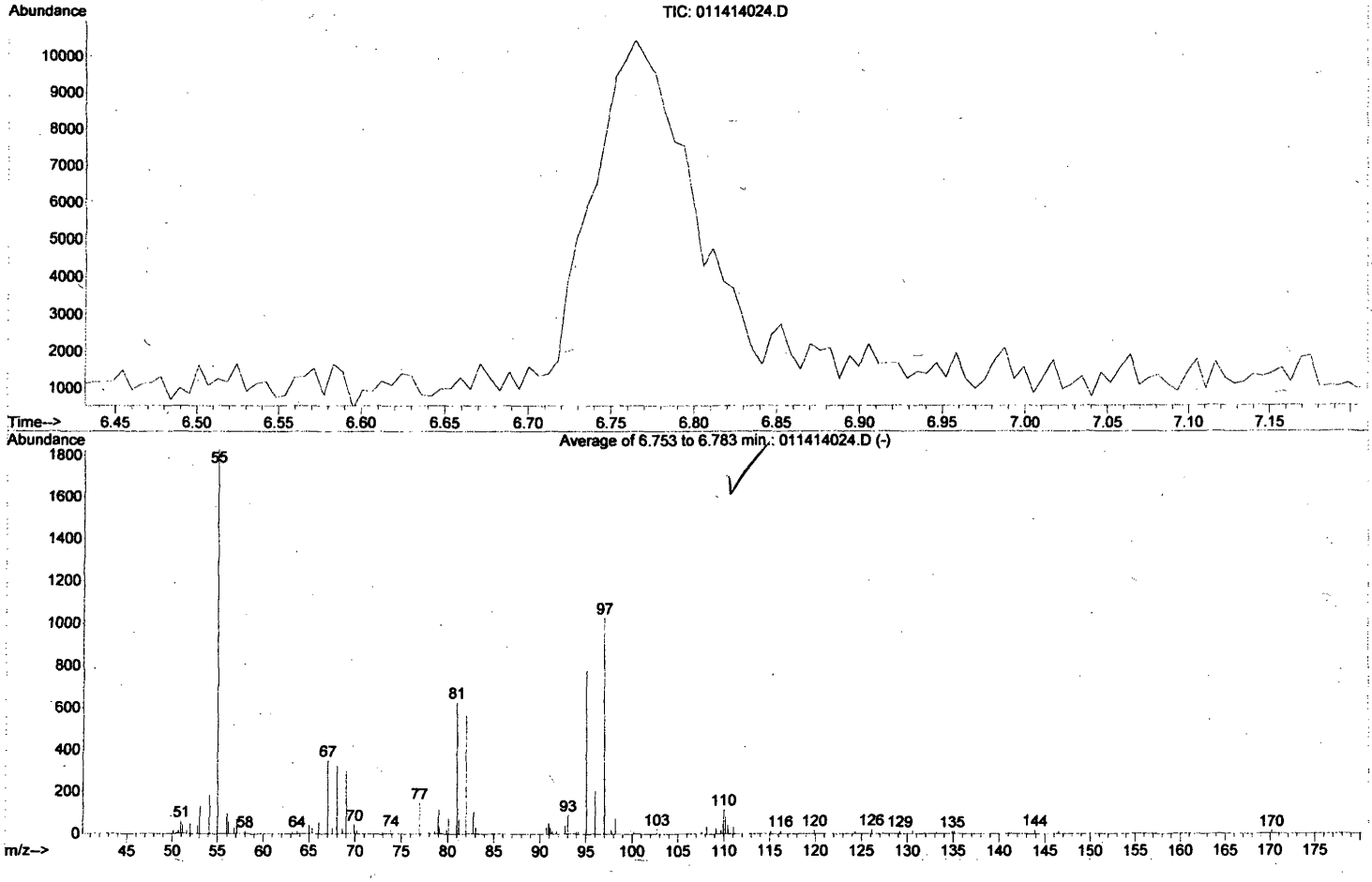


MCHM

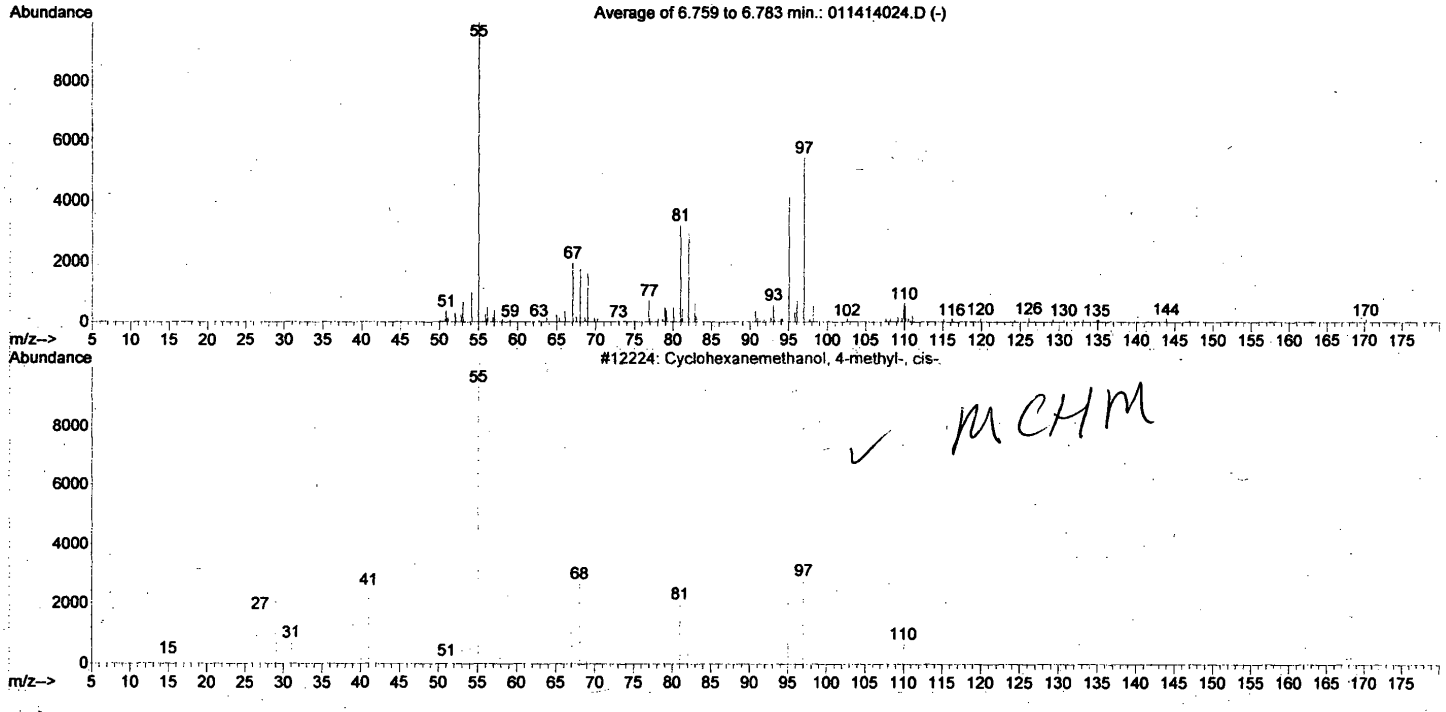
File :D:\MSDChem\1\DATA\WV\011414024.D
Operator : DK
Acquired : 14 Jan 2014 18:40 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 1400
Misc Info :
Vial Number: 36



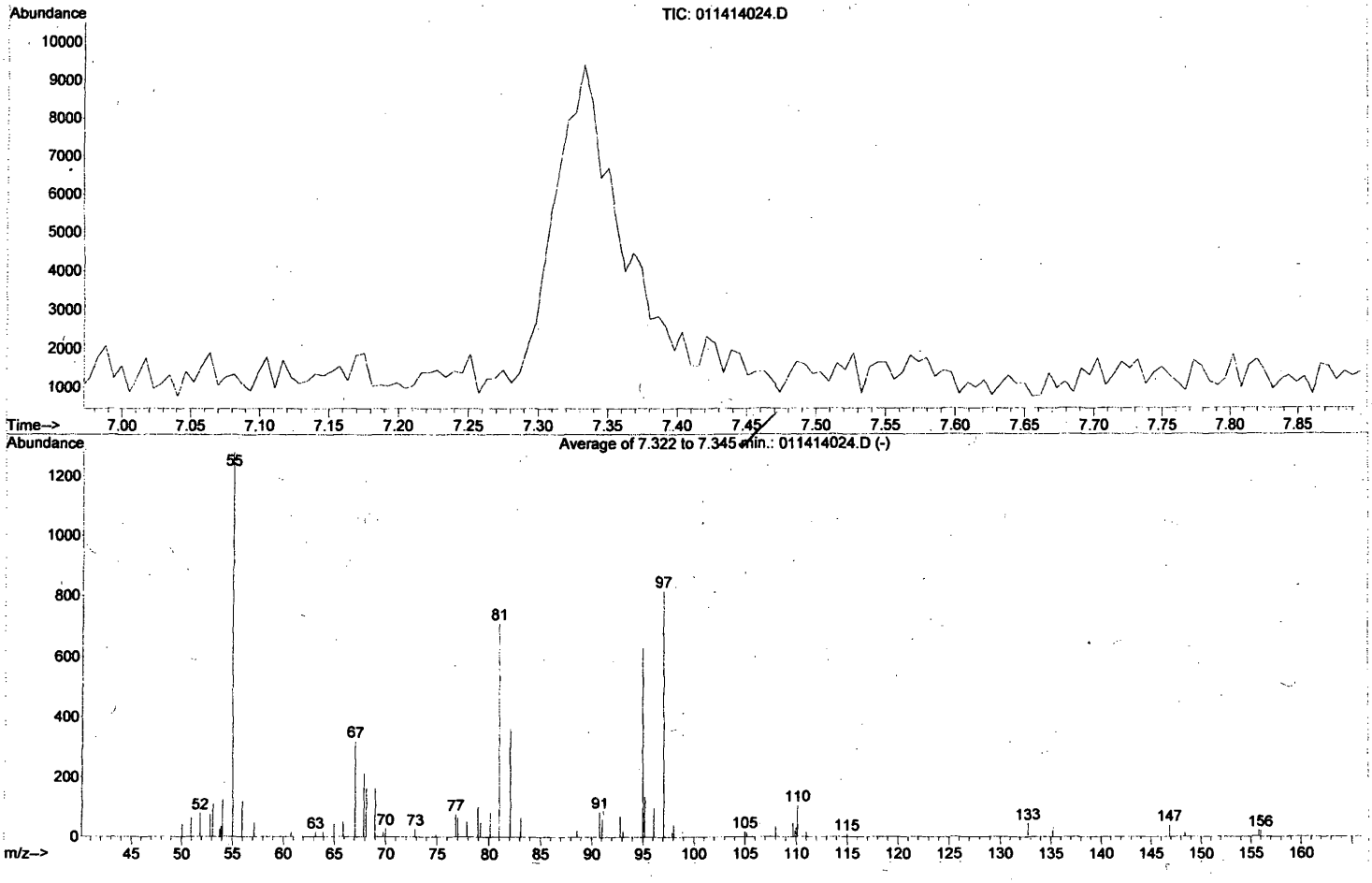
File :D:\MSDChem\1\DATA\WV\011414024.D
Operator : DK
Acquired : 14 Jan 2014 18:40 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 1400
Misc Info :
Vial Number: 36



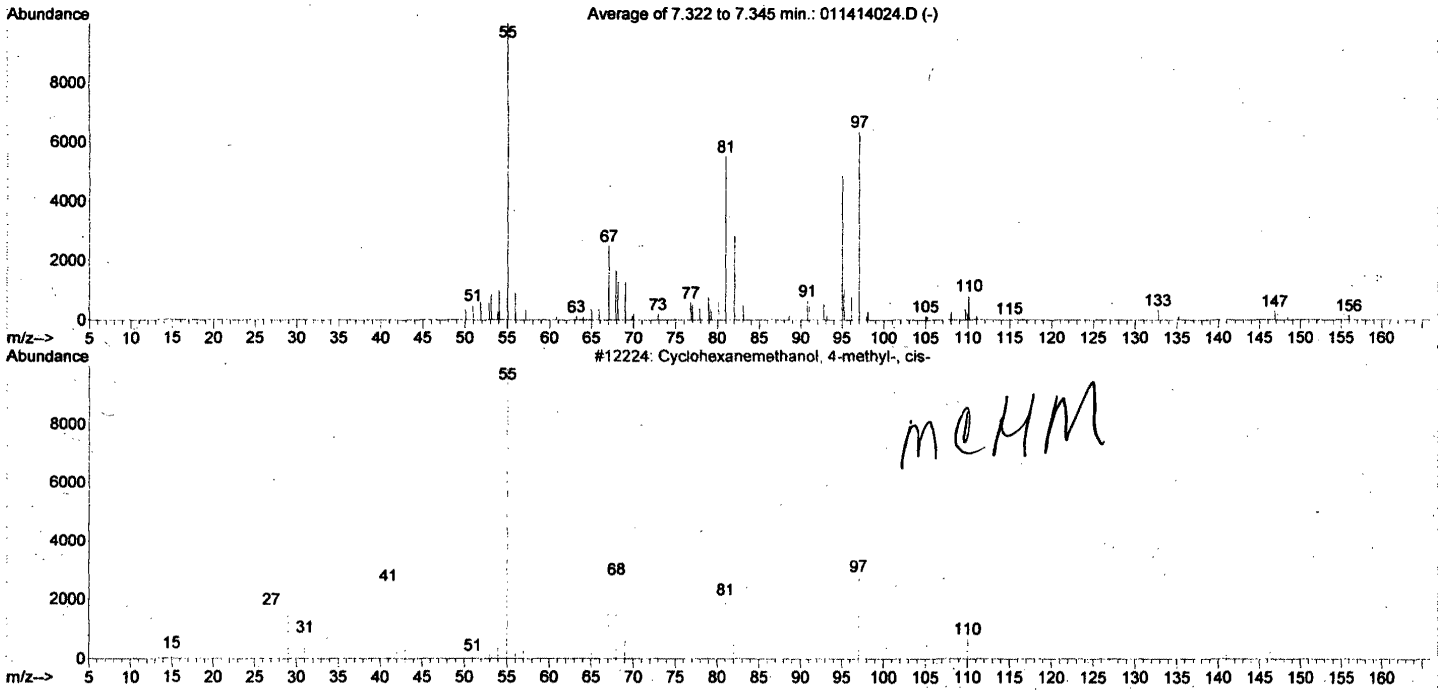
Library Searched : D:\Database\NIST02.L
Quality : 53
ID : Cyclohexanemethanol, 4-methyl-, cis-



File :D:\MSDChem\1\DATA\WV\011414024.D
Operator : DK
Acquired : 14 Jan 2014 18:40 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 1400
Misc Info :
Vial Number: 36

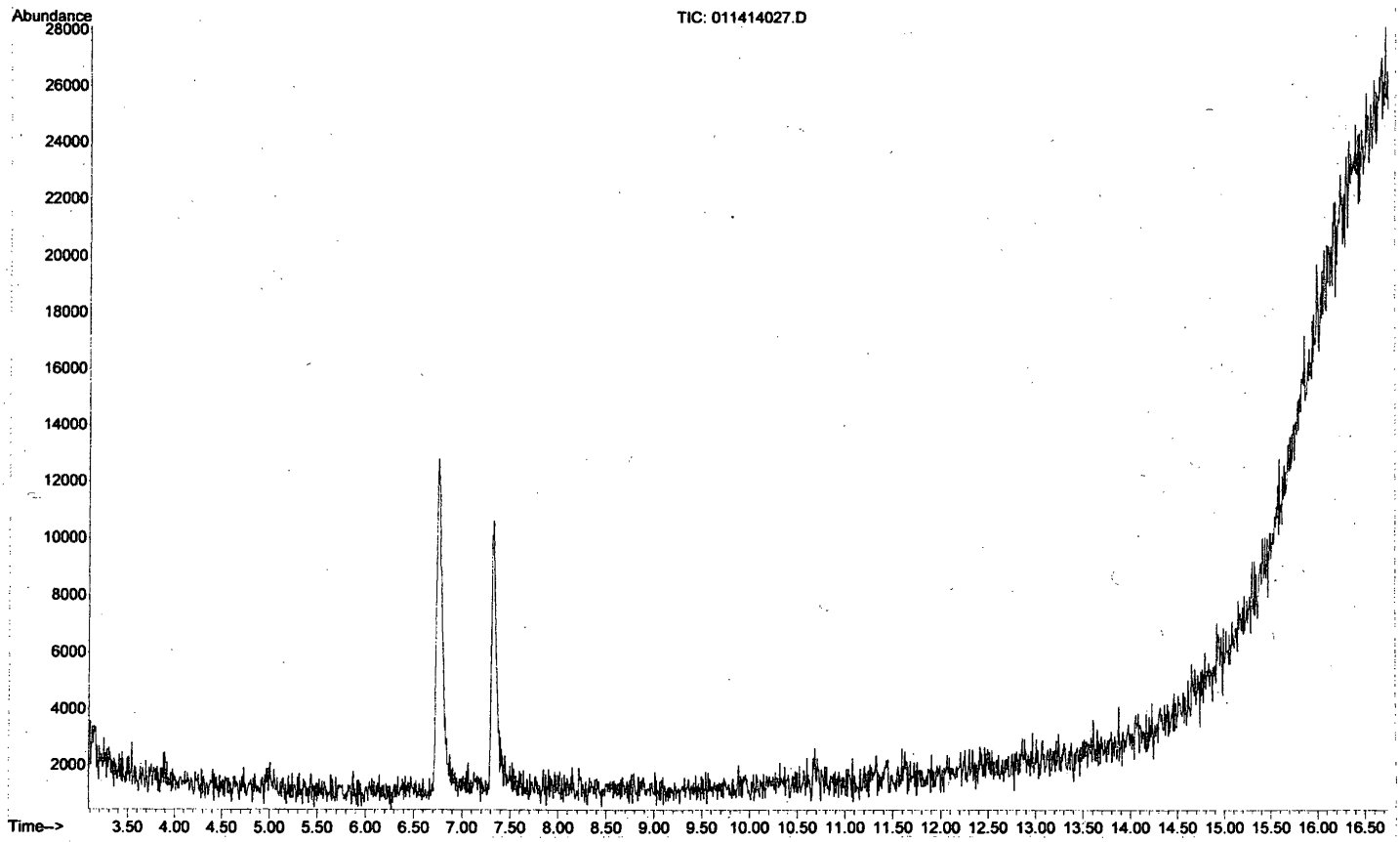


Library Searched : D:\Database\NIST02.L
Quality : 53
ID : Cyclohexanemethanol, 4-methyl-, cis-

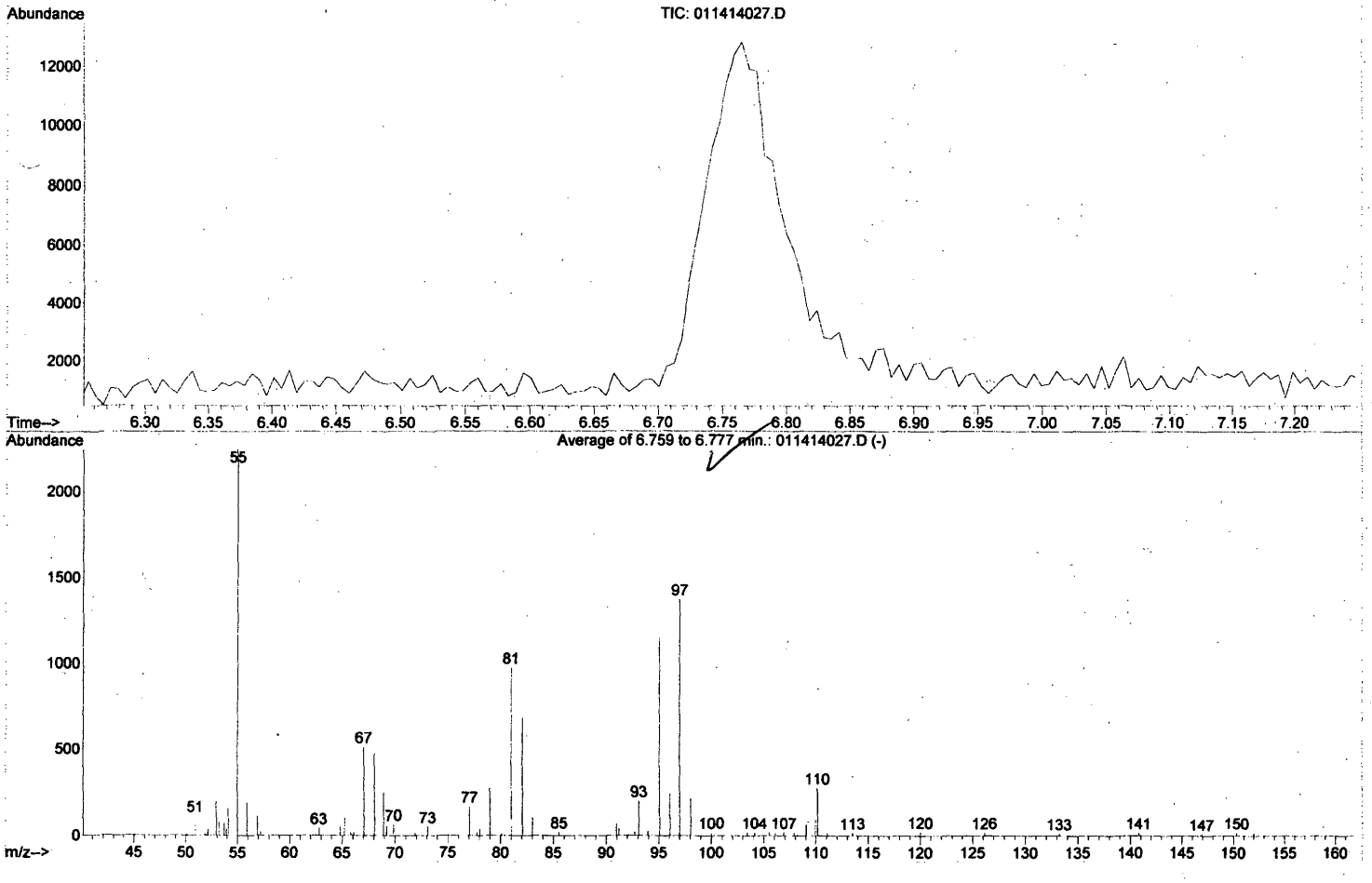


mCHM

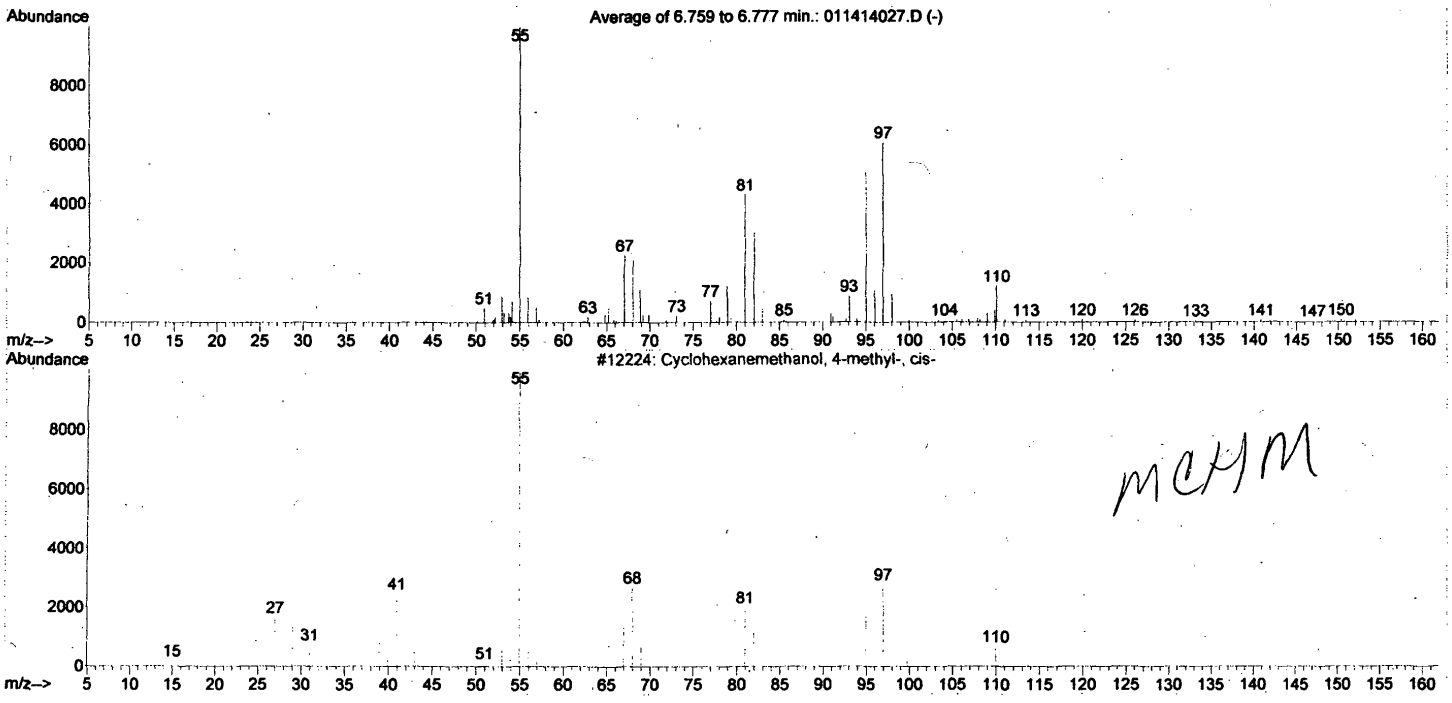
File :D:\MSDChem\1\DATA\WV\011414027.D
Operator : DK
Acquired : 14 Jan 2014 19:43 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 2230
Misc Info :
Vial Number: 39



File :D:\MSDChem\1\DATA\WV\011414027.D
Operator : DK
Acquired : 14 Jan 2014 19:43 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 2230
Misc Info :
Vial Number: 39

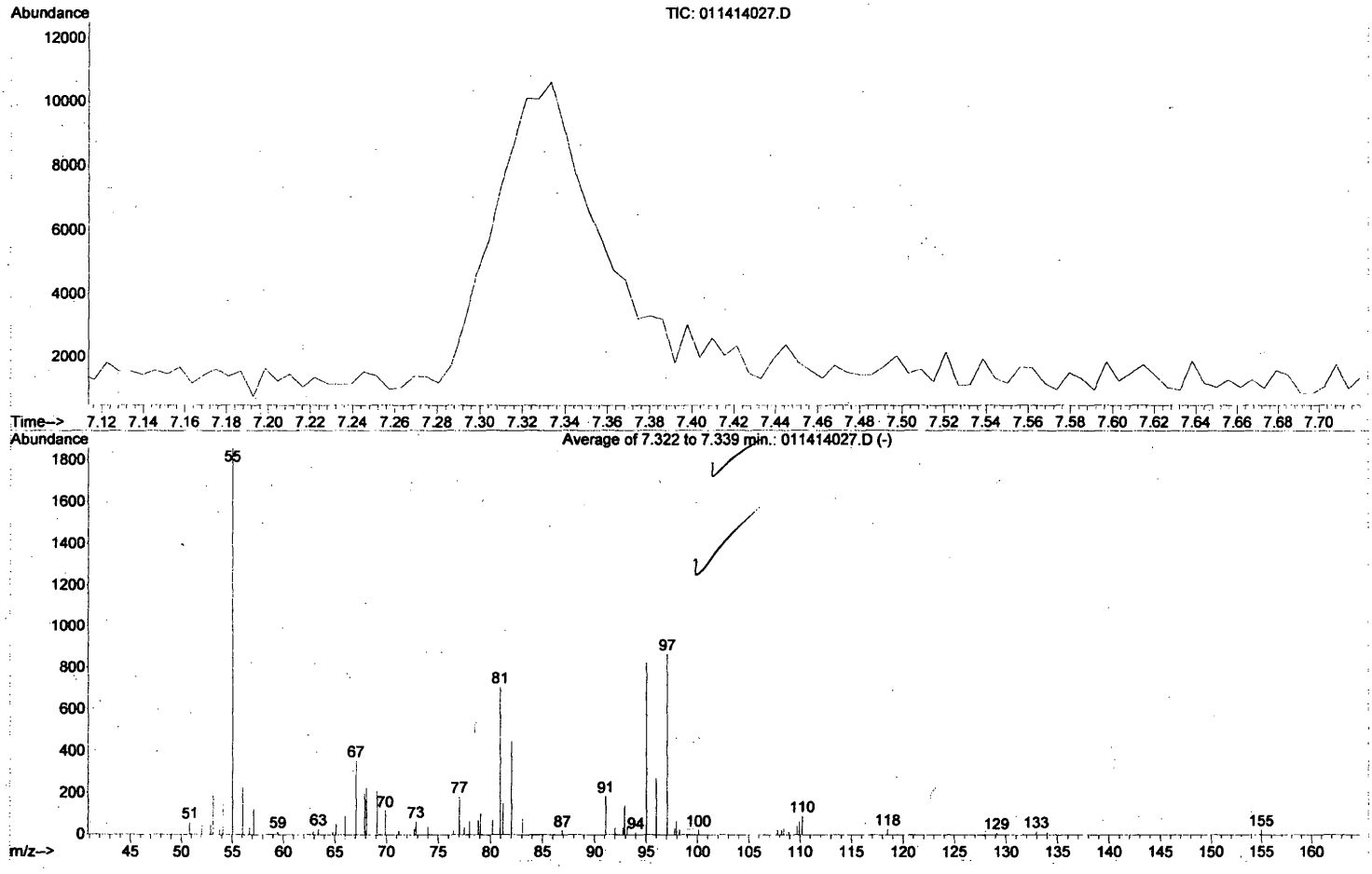


Library Searched : D:\Database\NIST02.L
Quality : 43
ID : Cyclohexanemethanol, 4-methyl-, cis-

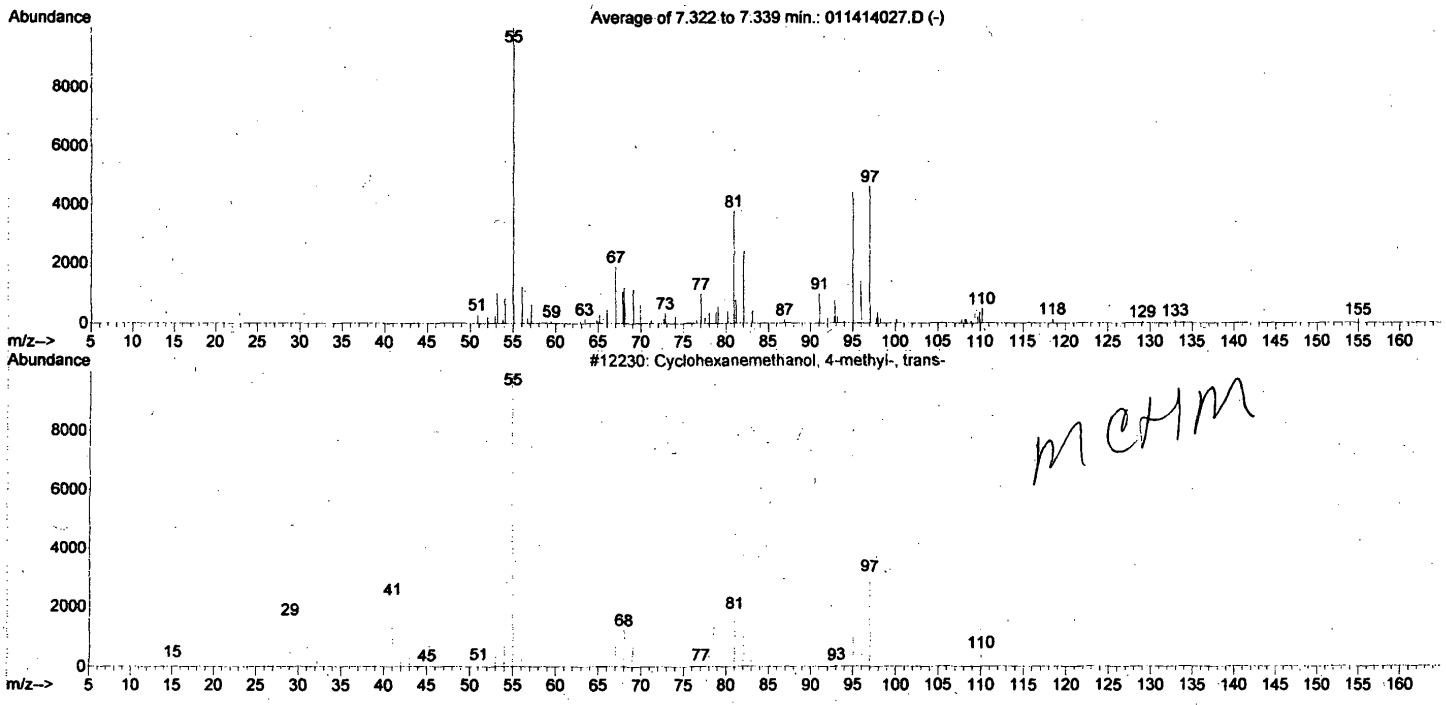


MeOH

File :D:\MSDChem\1\DATA\WV\011414027.D
Operator : DK
Acquired : 14 Jan 2014 19:43 using AcqMethod WV SHORT SCAN.M
Instrument : Snoopy
Sample Name: 2230
Misc Info :
Vial Number: 39



Library Searched : D:\Database\NIST02.L
Quality : 53
ID : Cyclohexanemethanol, 4-methyl-, trans-



mCHM

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Effect of Biodegradation on MCHM Released to the Elk River, West Virginia

Concept Proposal by Michelle M. Lorah, Charles Walker, and Doug Chambers

U.S. Geological Survey

As a result of the estimated 10,000-gallon spill of crude 4-methylcyclohexanemethanol (MCHM) that drained from a storage tank and entered the Elk River in West Virginia in January 2014, information on the environmental fate of this chemical mixture is critically needed. Little appears to be known about the transport properties and degradation reactions of MCHM, despite its common use as a frothing agent to clean coal and subsequent release to the environment in wash water. The relatively low solubility of MCHM in water and the lipophilic nature of this compound, as suggested by its chemical structure, indicate that sorption of MCHM to soils and sediment beneath the storage tank and in the bottom sediments of the Elk River could slow its transport and complete flushing from the area impacted by the spill. Slow release of MCHM from dissolution of pools of the compound and sorbed material could provide a long-term source of contaminants to water. For many organic compounds, biodegradation reactions are the primary mechanism for attenuation and potential complete destruction of the contaminant in soils, groundwater, and bottom sediments. Alternatively, biodegradation sometimes produces intermediate compounds that are more soluble and toxic than the parent compound (i.e. production of vinyl chloride from incomplete degradation of trichloroethylene). Defining biodegradation processes and products, therefore, is important to provide an understanding of the fate and toxicity of the MCHM released in this spill and at coal washing facilities. We propose to evaluate the biodegradation of crude MCHM and pure MCHM in laboratory microcosms using sediment exposed to crude MCHM at the spill site by the Elk River, West Virginia.

MCHM is a saturated alicyclic primary alcohol with a methyl (CH_3) and hydroxymethyl (CH_2OH) group on the cyclohexane ring, which can give *cis* and *trans* isomers depending on the positions of these groups. The relative amounts of the isomers and other components in crude MCHM commercial mixtures can vary with supplier. Eastman lists MCHM as consisting of 68-89 percent MCHM, 4-10 percent water, 5 percent methyl 4-methylcyclohexanecarboxylate, 1 percent dimethyl 1,4-cyclohexanedicarboxylate, 1-2 percent 1,4-cyclohexanedimethanol, and 1 percent methanol (Material Safety Data Sheet, Eastman Chemical Company, 2011). Only one limited study of biodegradation of MCHM is known, completed by Eastman Kodak Company of crude MCHM using a standard 28-day carbon dioxide (CO_2) evolution test and laboratory-prepared water that was inoculated with activated sludge microorganisms previously unexposed to MCHM (Beglinger, 1997). The crude MCHM was classified as "not readily biodegradable" according to the test protocol because less than 60 percent biodegradation was measured within 10 days. Substantial CO_2 evolution was measured, however, after a 9-day lag period and indicated 53-54 percent degradation within the 28-day test period. If microorganisms used in this test had been previously exposed to MCHM, the lag period before degradation may not have occurred. Degradation products besides CO_2 were not measured, nor the relative amount of MCHM degradation compared to other components of the crude mixture. Recent controversy over reports of possible formaldehyde generation from crude MCHM released in the West Virginia spill demonstrate the need to evaluate both pure MCHM and the crude mixture.

Although alicyclic hydrocarbons are substantial components of petroleum mixtures, and thus are common contaminants, relatively few studies of their biodegradation under aerobic and anaerobic conditions have been reported (Rios-Hernandez et al., 2003). Based on the chemical structure of MCHM, it is likely that the primary alcohol is oxidized to corresponding aldehydes

and carboxylic acid, producing intermediates such as 4-methylcyclohexanecarboxylic acid, which is a naphthenic acid. Naphthenic acids are natural components of hydrocarbon deposits and their environmental fate and toxicity have been reviewed recently because they are major contaminants in extraction water from oil sands and other petroleum deposits (Headley and McMartin, 2004). Naphthenic acids generally are considered weakly biodegradable, although both aerobic and anaerobic cultures of native microbial communities from oil sands tailings water have been shown to be capable of degrading a range of these compounds (Headley and McMartin, 2004). Alkylsuccinate derivatives, in addition to carboxylic acid compounds, also have been identified as metabolites under sulfate-reducing conditions in a study that used ethylcyclopentane as a model alicyclic hydrocarbon (Rios-Hernandez et al., 2003).

We propose to characterize the biodegradation processes, rates, and metabolites using site water and sediment with native microbial communities potentially acclimated to crude MCHM from exposure at the Elk River spill site to the MCHM. Replicate microcosms would be prepared in the laboratory under a range of redox conditions, amended with crude MCHM, and monitored for loss of MCHM and production and removal of metabolites. Sterile controls also would be prepared to measure potential loss due to abiotic processes such as sorption. Samples collected from the site would be analyzed for metabolites observed in the laboratory to confirm their potential importance on environmental fate of MCHM. Microcosm preparation and analysis would be performed in the USGS Maryland-Delaware-DC research laboratory. A GC/MS with purge and trap and a GC/FID are available in this laboratory for analyses. Additional analytical support could be obtained from the USGS National Water Quality Laboratory for metabolite identification. Collection of samples for laboratory testing and confirmation analyses would be performed the USGS West Virginia Water Science Center.

Recommend GC/MS to see breakdown products

References Cited

Beglinger, J.M., 1997, Determination of ready biodegradability (biotic degradation) using the CO_2 evolution test (modified Sturm), Study No. EN-113-872790-1: Eastman Chemical Company, Rochester, NY, 41 p. Accessed on February 12, 2014 at http://www.eastman.com/Pages/Eastman-Crude-MCHM-Studies.aspx.

Headley, J.V., and McMartin, D.W., 2004, A Review of the Occurrence and Fate of Naphthenic Acids in Aquatic Environments: Journal of Environmental Science and Health Part A—Toxic/Hazardous Substances & Environmental Engineering, vol. A39, no. 8, pp. 1989–2010.

Rios-Hernandex, L.A., Gieg, L.M., and Suflita, J.M., 2003, Biodegradation of an alicyclic hydrocarbon by a sulfate-reducing enrichment from a gas condensate-contaminated aquifer: Applied and Environmental Microbiology, v. 69, no. 1, p. 434-443.

Speijers, G.J.A., and Renwick, A. Alicyclic Primary Alcohols, Aldehydes, Acids, and Related Esters, WHO Food Additive Series: 50. INCHEM: International Programme on Chemical Safety. Accessed on February 12, 2014 at http://www.inchem.org/documents/jecfa/jecmono/v50je10.htm.

Warner, Sue

From: Molnar, Adam
Sent: Monday, February 24, 2014 4:05 PM
To: Caporale, Cynthia; Gundersen, Jennifer; Warner, Sue
Subject: RE: Fwd: MCHM fate and biotransformation proposal
Attachments: Holding Time Test.xlsx

Holding time study

I extracted 12 samples at various concentrations (20ppb/10ppb/5ppb in the aqueous sample which would calculate to 1000/500/250 ppb in the extract) and a blank. 8 samples are at concentrations high enough to see on the GC-FID.

I ran an analysis on 2/11, 2/18, and 2/24 (today). I've worked up the 2/11 and 2/18 data and there is no significant drop in concentration for PPH over those 7 days. There are small differences in the concentration of PPH <10% either higher or lower. I can take a look at the 2/24 data tomorrow morning for a 14 day trend and report the results in the morning. For a full 28 day holding time test we would need to wait until 3/11.

I'm not seeing an MCHM degradation on the order of days. These results were produced by extracting 50 mL of MilliQ water spiked with MCHM and PPH in methanol with 2 mL Hexane after the addition of NaCl. The extracts were then analyzed on a dual column GC-FID. I did run these extracts on two different columns but I decided to only report the result from the column with superior chromatography which is an Rtx-1701. I have data from the other column as well but there are interfering peaks and less sensitivity on that column which is a Restek Stabilwax. The Stabilwax data is good but not as good.

Let me know if you want me to continue this test after 2/24 and let me know if you want the Stabilwax column results. Otherwise I was going to stop running on that column.

I attached a spreadsheet with the results.

Adam Molnar
Chemist
U.S. EPA Region 3
701 Mapes Road
Fort Meade, MD 20755
(410) 305-2676
molnar.adam@epa.gov

From: Caporale, Cynthia
Sent: Monday, February 24, 2014 2:23 PM
To: Gundersen, Jennifer; Warner, Sue; Molnar, Adam
Subject: FW: Fwd: MCHM fate and biotransformation proposal

Please review and let me know if you have comments. Also, not sure where we are with a HT study in hexane?? Any ideas the HT in the samples we received?

From: Hedrick, Elizabeth
Sent: Monday, February 24, 2014 2:07 PM

To: Caporale, Cynthia
Subject: FW: Fwd: MCHM fate and biotransformation proposal

I am passing this along as the proposal mentions the carboxylic acid (CA) of MCHM. It appears that other chemists are thinking along the same line. The proposal's authors do not have GC-MS (just FID) which I think might be a hindrance to elucidating structures. If you have lab folks still working on this it might be worth looking for the CA and developing a method for it (you can purchase the CA). The pKa will be much lower than for MCHM which could be used to optimize its extraction.

I have accumulated some articles on napthenic acids. If you are interested, I can share them with you.

And lastly, GCWW has informally shared with us the fact that they are observing degradation of MCHM on the order of days. I don't have any more details on how they held the samples but if you are interested we could put you in touch with them.

Thanks,

Elizabeth

Water Security Division
Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency
26 West Martin Luther King Drive
MS 140
Cincinnati, Ohio 45268
Ph (513) 569-7296
Fax (513) 569-7191

From: Allgeier, Steve
Sent: Monday, February 24, 2014 11:43 AM
To: Lindquist, Alan; Magnuson, Matthew; Hedrick, Elizabeth
Subject: FW: Fwd: MCHM fate and biotransformation proposal

Just FYI

From: Arguto, William
Sent: Monday, February 24, 2014 10:14 AM
To: Allgeier, Steve
Cc: binetti, victoria; Wisniewski, Patti-Kay
Subject: FW: Fwd: MCHM fate and biotransformation proposal

Steve – an FYI on USGS research

Bill

From: Kelly, Jack (R3 Phila.)
Sent: Monday, February 24, 2014 9:46 AM
To: Arguto, William; Wisniewski, Patti-Kay; binetti, victoria; Werner, Lora; Markiewicz, Karl; Helverson, Robert; Burns, Francis; Singhvi, Raj; Caporale, Cynthia
Cc: Linden, melissa; Matlock, Dennis; Smith, Art; Gilbert, John
Subject: Fw: Fwd: MCHM fate and biotransformation proposal

I can't review now just passing on for later discussion.

From: Matlock, Dennis
Sent: Monday, February 24, 2014 9:39:52 AM
To: Kelly, Jack (R3 Phila.)
Subject: Fw: Fwd: MCHM fate and biotransformation proposal

Jack fyi
Pass along as you like.
Thx
dennis

From: Dorsey, Mike H <Mike.H.Dorsey@wv.gov>
Sent: Monday, February 24, 2014 8:57:28 AM
To: Rusty; Matlock, Dennis
Subject: Fwd: MCHM fate and biotransformation proposal

FYI.

Sent from my iPhone

Begin forwarded message:

> **From:** "Campbell, Patrick V" <Patrick.V.Campbell@wv.gov>
> **Date:** February 24, 2014 at 8:55:52 AM EST
> **To:** "Dorsey, Mike H" <Mike.H.Dorsey@wv.gov>, "Hickman, Joseph M" <Joseph.M.Hickman@wv.gov>
> **Cc:** "Mandirola, Scott G" <Scott.G.Mandirola@wv.gov>
> **Subject: FW: MCHM fate and biotransformation proposal**
>
> Mike/Joe – looks like the USGS science guys have been doing some heavy thinking on mchm degradation. I've asked them for info on price and how qwik we could get some preliminary answers.
>
> I'd be interested to know if this piques y'alls interest, or if you believe it is more of Freedom's problem.
>
> One end product may be identification of bugs that like to eat mchm, or mchm-petroleum mixes. In the other places they've come up with a hungry bug mix, then had contractors deploy them as part of the cleanup.
>
> **From:** Chambers, Douglas [mailto:dbchambe@usgs.gov]
> **Sent:** Thursday, February 20, 2014 2:07 PM
> **To:** Campbell, Patrick V; Wirts, John C
> **Subject:** MCHM fate and biotransformation proposal
>
> Pat, John,

When I was working in the Baltimore office over the past few years I became acquainted with the researchers on the Fate and Bioremediation Team there. These folks have been working on tracking the environmental fate and degradation of compounds at locations such as Aberdeen Proving Grounds and White Sands Missile Range. I spoke to them about the MCHM spill, just to get their take on the situation. After some thought they came up with the following. I felt it was worth passing along to you.

--

Douglas B. Chambers
Biologist/Water-Quality Specialist
USGS West Virginia Water Science Center
304 347-5130 ext 231
Mobile 304 590-1276

Warner, Sue

From: Gundersen, Jennifer
Sent: Monday, February 24, 2014 5:27 PM
To: Caporale, Cynthia
Cc: Warner, Sue; Molnar, Adam
Subject: RE: Fwd: MCHM fate and biotransformation proposal

They should include PPH in the study. We know it's there, it's possibly more toxic and the aromatic rings will likely remain intact throughout whatever degradation processes happen

---

From: Caporale, Cynthia
Sent: Monday, February 24, 2014 2:23 PM
To: Gundersen, Jennifer; Warner, Sue; Molnar, Adam
Subject: FW: Fwd: MCHM fate and biotransformation proposal

Please review and let me know if you have comments. Also, not sure where we are with a HT study in hexane?? Any ideas the HT in the samples we received?

From: Hedrick, Elizabeth
Sent: Monday, February 24, 2014 2:07 PM
To: Caporale, Cynthia
Subject: FW: Fwd: MCHM fate and biotransformation proposal

I am passing this along as the proposal mentions the carboxylic acid (CA) of MCHM. It appears that other chemists are thinking along the same line. The proposal's authors do not have GC-MS (just FID) which I think might be a hindrance to elucidating structures. If you have lab folks still working on this it might be worth looking for the CA and developing a method for it (you can purchase the CA). The pKa will be much lower than for MCHM which could be used to optimize its extraction.

I have accumulated some articles on napthenic acids. If you are interested, I can share them with you.

And lastly, GCWW has informally shared with us the fact that they are observing degradation of MCHM on the order of days. I don't have any more details on how they held the samples but if you are interested we could put you in touch with them.

Thanks,

Elizabeth

Water Security Division
Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency
26 West Martin Luther King Drive
MS 140
Cincinnati, Ohio 45268
Ph (513) 569-7296
Fax (513) 569-7191

From: Allgeier, Steve
Sent: Monday, February 24, 2014 11:43 AM
To: Lindquist, Alan; Magnuson, Matthew; Hedrick, Elizabeth
Subject: FW: Fwd: MCHM fate and biotransformation proposal

Just FYI

From: Arguto, William
Sent: Monday, February 24, 2014 10:14 AM
To: Allgeier, Steve
Cc: binetti, victoria; Wisniewski, Patti-Kay
Subject: FW: Fwd: MCHM fate and biotransformation proposal

Steve – an FYI on USGS research

Bill

From: Kelly, Jack (R3 Phila.)
Sent: Monday, February 24, 2014 9:46 AM
To: Arguto, William; Wisniewski, Patti-Kay; binetti, victoria; Werner, Lora; Markiewicz, Karl; Helverson, Robert; Burns, Francis; Singhvi, Raj; Caporale, Cynthia
Cc: Linden, melissa; Matlock, Dennis; Smith, Art; Gilbert, John
Subject: Fw: Fwd: MCHM fate and biotransformation proposal

I can't review now just passing on for later discussion.

From: Matlock, Dennis
Sent: Monday, February 24, 2014 9:39:52 AM
To: Kelly, Jack (R3 Phila.)
Subject: Fw: Fwd: MCHM fate and biotransformation proposal

Jack fyi
Pass along as you like.
Thx
dennis

From: Dorsey, Mike H <Mike.H.Dorsey@wv.gov>
Sent: Monday, February 24, 2014 8:57:28 AM
To: Rusty; Matlock, Dennis
Subject: Fwd: MCHM fate and biotransformation proposal

FYI.

Sent from my iPhone

Begin forwarded message:

> **From:** "Campbell, Patrick V" <Patrick.V.Campbell@wv.gov>
> **Date:** February 24, 2014 at 8:55:52 AM EST
> **To:** "Dorsey, Mike H" <Mike.H.Dorsey@wv.gov>, "Hickman, Joseph M" <Joseph.M.Hickman@wv.gov>

Cc: "Mandirola, Scott G" <Scott.G.Mandirola@wv.gov>
Subject: FW: MCHM fate and biotransformation proposal

Mike/Joe – looks like the USGS science guys have been doing some heavy thinking on mchm degradation. I've asked them for info on price and how qwik we could get some preliminary answers.

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One end product may be identification of bugs that like to eat mchm, or mchm-petroleum mixes. In the other places they've come up with a hungry bug mix, then had contractors deploy them as part of the cleanup.

From: Chambers, Douglas [mailto:dbchambe@usgs.gov]
Sent: Thursday, February 20, 2014 2:07 PM
To: Campbell, Patrick V; Wirts, John C
Subject: MCHM fate and biotransformation proposal

Pat, John,

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--
Douglas B. Chambers
Biologist/Water-Quality Specialist
USGS West Virginia Water Science Center
304 347-5130 ext 231
Mobile 304 590-1276

Warner, Sue

From: Caporale, Cynthia
Sent: Tuesday, February 25, 2014 9:10 AM
To: Warner, Sue
Subject: RE: Charleston DW GC/MS Data Request

Ex. 5 - Deliberative

From: Caporale, Cynthia
Sent: Tuesday, February 25, 2014 7:57 AM
To: Warner, Sue
Subject: FW: Charleston DW GC/MS Data Request

Did you happen to contact Ms. Peters on Friday? Do we need to discuss before responding or arrange a call?

From: Peters, Julie N [mailto:PetersJ@battelle.org]
Sent: Friday, February 21, 2014 3:12 PM
To: Caporale, Cynthia
Cc: Warner, Sue; Arguto, William
Subject: RE: Charleston DW GC/MS Data Request

Actually now that I have had a chance to look at everything again, I do have a couple of questions. I am having some trouble identifying which samples fit with your request. I received a COC with limited information with each set of samples. I have attached a memo report containing all results. Would you please identify the samples for which you would like us to provide data?

Also, just to clarify, we did acquire data in full scan mode however we did not process it for all peaks within the chromatogram. We only looked for cis and trans MCHC using retention time and spectral matching to the reference material provided for use as a standard. We did not use an EPA type protocol. We were provided a Dupont method through the CST unit.

Julie Peters
Principal Research Scientist
Hazard Characterization
CBRNE Defense Threat Assessment Group
Office: 614.424.4741| Mobile: 614.563.7342 | Fax: 614.458.4741
petersj@battelle.org

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505 King Ave
Columbus, Ohio 43201
http://www.battelle.org

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Twitter | YouTube

From: Caporale, Cynthia [mailto:Caporale.Cynthia@epa.gov]
Sent: Friday, February 21, 2014 7:57 AM
To: Peters, Julie N
Cc: Warner, Sue; Arguto, William
Subject: RE: Charleston DW GC/MS Data Request

Hi Julie.

Thank you for your response. We look forward to the information you can share concerning the DW samples. If you have any specific questions please don't hesitate to call me or Sue Warner (410)305-2658.

Thanks!
Cindy

Cynthia Caporale, Chief
OASQA Laboratory Branch
U.S. EPA Region III
Environmental Science Center
Fort Meade, MD
(410) 305-2732
Fax: (410) 305-3095

From: Peters, Julie N [mailto:PetersJ@battelle.org]
Sent: Monday, February 17, 2014 1:04 PM
To: Caporale, Cynthia
Subject: RE: Charleston DW GC/MS Data Request

We did run samples. I will get you a data package this week.

Thanks,

Julie Peters
Principal Research Scientist
Hazard Characterization
CBRNE Defense Threat Assessment Group
Office: 614.424.4741| Mobile: 614.563.7342 | Fax: 614.458.4741
petersj@battelle.org

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Columbus, Ohio 43201
http://www.battelle.org

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From: Caporale, Cynthia [mailto:Caporale.Cynthia@epa.gov]
Sent: Friday, February 14, 2014 2:47 PM
To: Peters, Julie N
Cc: Warner, Sue
Subject: Charleston DW GC/MS Data Request

Ms. Peters,

I am the USEPA R3 Lab Manager and I am working with our Drinking Water Program managers to review existing GC/MS data that may have been acquired by laboratories during the initial days of the Charleston Drinking Water Incident.

Did your laboratory run the drinking water samples using GC/MS in full-scan for any of the drinking water samples (pre- and post-treatment)? If so, we would be interested in the raw data from some of the sample analysis. Below is the specific information we are seeking.

VOC and SVOC GC/MS raw data files, including a TIC report processed against the NIST or similar library, which includes the chromatogram and spectra for the 20 largest TICs, for the following samples that were been analyzed using a full scan rather than targeted MCHM scan:

- Approximately 4 of the highest quantitative results for MCHM at locations in the distribution system
- Plant finished water sample showing high quantitative result for MCHM

Please clarify the instrument type, method used (Drinking water versus SW-846 type protocol), and preservative/quench agent.

Please feel free to contact me for more information or if you have any questions.

Thanks,
Cindy

Cynthia Caporale, Chief
OASQA Laboratory Branch
U.S. EPA Region III
Environmental Science Center
Fort Meade, MD
(410) 305-2732
Fax: (410) 305-3095

Battelle
The Business of Innovation

Date: 13 February 2014

To: SGT Sean Courtney

From: Ex. 6 - Personal Privacy Battelle)

Subject: Combined Results for Sample Analysis

Results from the analysis of all samples received by Battelle are provided in the table below. The samples were analyzed in an ISO 9001 accredited laboratory. These results are provided to West Virginia, and were generated by applying standard laboratory gas chromatograph mass spectrometer analysis processes to the samples provided by West Virginia. West Virginia indemnifies and holds Battelle harmless from any lawsuits, litigation or damages asserted by any third party based upon West Virginia's use of this data. Battelle shall not be liable for any consequential, punitive, or special damages resulting from this data.

Thank you,

Ex. 6 - Personal Privacy

Principal Research Scientist
Hazard Characterization
CBRNE Defense Threat Assessment Group

Ex. 6 - Personal Privacy

Sample Location	Date	Sample Number	MCHM Concentration (ppm)	Comments
DO DROP INN/PUT	1/12/2014	2340A	Not Detected	
HYDRANT #2354/KAN	1/12/2014	2340B	0.263	< 0.7 ppm standard
HYDRANT #5193/KAN	1/13/2014	0100	0.580	< 0.7 ppm standard
3301 AUSTIN DRIVE/PUT	1/12/2014	2153	Not Detected	
219A MYNES ROAD/PUT	1/12/2014	2256	0.671	< 0.7 ppm standard
276 STRICKLIN ROAD/PUT	1/12/2014	2339	0.727	
RT34 DANIEL BOONE TR/PUT	1/13/2014	0222	0.619	< 0.7 ppm standard
RT2 BOX 114/PUT	1/13/2014	0324	Not Detected	
RT2 BOX238A1/PUT	1/13/2014	0339	1.372	
HYDRANT #270/PUT	1/13/2014	0150	Not Detected	
RT2 BOX 63a/PUT	1/13/2014	0237	0.798	
MAP #72201/PUT	1/12/2014	2345	0.804	
MAP#72223/PUT	1/12/2014	2300	0.719	
MAP #72204/PUT	1/13/2014	0040	Not Detected	
MAP #73158/PUT	1/13/2014	0115	Not Detected	
BOWLS RIDGE/PUT	1/13/2014	0230	Not Detected	
FISHER RIDGE/PUT	1/13/2014	0200	Not Detected	
MYNES ROAD/PUT	1/12/2014	2249	0.046	< 0.7 ppm standard
HYDRANT #2563/KAN	1/12/2014	1622	0.276	< 0.7 ppm standard
HYDRANT #2667/KAN	1/12/2014	1551	Not Detected	
HYDRANT #2612/KAN	1/12/2014	1609	0.252	< 0.7 ppm standard
HYDRANT #2331	1/12/2014	2218	Not Detected	Not listed on COC
FH 5718	1/13/2014	1253	Not Detected	Not listed on COC
2103	1/13/2014	1255	0.147	Not listed on COC, < 0.7 ppm standard
#417	1/13/2014	1305	Not Detected	Not listed on COC
2049	1/13/2014	1215	Not Detected	Not listed on COC
2055	1/13/2014	1230	Not Detected	Not listed on COC
5708	1/13/2014	1240	Not Detected	Not listed on COC
2579	1/13/2014	1325	2.831	Not listed on COC, > 1.5 ppm standard
SPRING FORK/ Z-12	1/13/2014	1730	Not Detected	
CENTER ST & PRATT AVE / Z-12	1/13/2014	1530	Not Detected	
VALEY GROVE / Z-12	1/13/2014	1834	0.501	< 0.7 ppm standard
HYD 6651 / PUT	1/13/2014	1807	Not Detected	
318 THORAFARE / KAN	1/13/2014	1821	Not Detected	

Sample Location	Date	Sample Number	MCHM Concentration (ppm)	Comments
RT 17 & HADDELTON RD / KAN	1/13/2014	1528	0.571	< 0.7 ppm standard
HYD # 26431 / KAN	1/13/2014	1228	Not Detected	
HYD 2719 / KAN	1/13/2014	1715	0.523	< 0.7 ppm standard
HYD 2979 / PUT	1/13/2014	1704	Not Detected	
NATIONAL GUARD PRV / KAN	1/13/2014	1515	Not Detected	
HYD 2797 / KAN	1/13/2014	1440	0.377	< 0.7 ppm standard
RT 3 HSE # 723/ KAN	1/13/2014	1510	Not Detected	
HYD 6429 / PUT	1/13/2014	1851	Not Detected	
3814 LENS CREEK RD / KAN	1/13/2014	1336	Not Detected	
HYD 3030 / PUT/ Z-10	1/13/2014	1655	Not Detected	
BALLPARK / Z-12	1/13/2014	1746	Not Detected	
3274 CAMPBELLS CREEK DRIVE / Z-12	1/13/2014	1759	Not Detected	
HILLCREST & DOGWOOD. PEYTONA ESTATES / KAN	1/13/2014	1354	Not Detected	
HYD 2651 / KAN	1/13/2014	1340	Not Detected	
HILLCREST & DOGWOOD. PEYTONA ESTATES / KAN	1/13/2014	1358	Not Detected	
HYDRANT # 2582 / KAN	1/13/2014	1311	Not Detected	
HYD 6048 / PUT / Z-10	1/13/2014	1545	0.530	< 0.7 ppm standard
HYD 6432 / PUT / Z-11	1/13/2014	1841	0.600	< 0.7 ppm standard
ELK 2 MILE	1/13/2014	1820	0.596	< 0.7 ppm standard
GEORGES CREEK BOOSTER / Z-12	1/13/2014	1719	Not Detected	
HYD 3162 / Z-12	1/13/2014	2130	Not Detected	
HYD # 2341 / Z-09	1/13/2014	1422	Not Detected	
RT 60 @ Engines Inc. / Z-11	1/14/2014	0421	Not Detected	
HYD 25820 / Z-13	1/13/2014	1520	~~0.747~~	
HYD 2754 / KAN	1/13/2014	1600	Not Detected	
HYD 2331 / Z-09	1/13/2014	1358	Not Detected	
RT 94 Old Fire House / Z-13	1/13/2014	1540	0.451	< 0.7 ppm standard
302 Main St / Z-13	1/13/2014	1440	Not Detected	
Stephensun Ave., Racine Hill / Z-13	1/13/2014	1510	Not Detected	
State St and C Ave / Z-13	1/13/2014	1420	Not Detected	
6962 Price Branch Rd / Z-13	1/13/2014	1410	0.526	< 0.7 ppm standard

Sample Location	Date	Sample Number	MCHM Concentration (ppm)	Comments
HYD 27659 / Z-13	1/13/2014	1550	0.568	< 0.7 ppm standard
William Mtn #1 Booster / Z-13	1/13/2014	1500	0.691	< 0.7 ppm standard
Price Branch & Thurmond St HSE #6001 / Z-13	1/13/2014	1400	0.908	
7561 Hamlin Rd / Z-11	1/14/2014	0205	0.536	< 0.7 ppm standard
246 Cooper Hollow Rd / Z-12	1/13/2014	2300	0.628	< 0.7 ppm standard
HYD 2616, Sunny Slide LN, Wineforde Hollow / Z-12	1/13/2014	2230	1.066	
Raw	1/15/2014	1600	Not Detected	
Finished	1/15/2014	1600	Not Detected	
Raw	1/15/2014	1000	Not Detected	
Finished	1/15/2014	1000	Not Detected	
Raw	1/15/2014	1300	Not Detected	
Finished	1/15/2014	1300	Not Detected	
Raw	1/15/2014	0800	Not Detected	
Finished	1/15/2014	0800	Not Detected	
Raw	1/15/2014	1800	Not Detected	
Finished	1/15/2014	1800	Not Detected	
Raw	1/15/2014	1100	Not Detected	
Finished	1/15/2014	1100	Not Detected	
Raw	1/15/2014	0900	Not Detected	
Finished	1/15/2014	0900	Not Detected	
Raw	1/15/2014	1200	Not Detected	
Finished	1/15/2014	1200	Not Detected	
Raw	1/15/2014	1400	Not Detected	
Finished	1/15/2014	1400	Not Detected	
Pond Gap Hydrant, Under Tank / Z20	1/16/2014	0810	Not Detected	
Pond Gap Booster / Z20	1/16/2014	0801	0.676	< 0.7 ppm standard

Warner, Sue

From: Warner, Sue
Sent: Friday, February 21, 2014 4:25 PM
To: Caporale, Cynthia
Subject: RE: Charleston DW GC/MS Data Request

Cindy,

I think we would want to look at all data that had MCHM hits. They should be able to go back and crunch the data for targets and TICs. If they don't have a target mix analyzed around the same time, they can process everything as TICs.

We can talk about this Monday.

Sue

From: Ex. 6 - Personal Privacy
Sent: Friday, February 21, 2014 3:12 PM
To: Caporale, Cynthia
Cc: Warner, Sue; Arguto, William
Subject: RE: Charleston DW GC/MS Data Request

Actually now that I have had a chance to look at everything again, I do have a couple of questions. I am having some trouble identifying which samples fit with your request. I received a COC with limited information with each set of samples. I have attached a memo report containing all results. Would you please identify the samples for which you would like us to provide data?

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Ex. 6 - Personal Privacy
Principal Research Scientist
Hazard Characterization
CBRNE Defense Threat Assessment Group
Ex. 6 - Personal Privacy

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From: Caporale, Cynthia [mailto:Caporale.Cynthia@epa.gov]
Sent: Friday, February 21, 2014 7:57 AM
To: Ex. 6 - Personal Privacy
Cc: Warner, Sue; Arguto, William
Subject: RE: Charleston DW GC/MS Data Request

Hi Julie.

Thank you for your response. We look forward to the information you can share concerning the DW samples. If you have any specific questions please don't hesitate to call me or Sue Warner (410)305-2658.

Thanks!
Cindy

Cynthia Caporale, Chief
OASQA Laboratory Branch
U.S. EPA Region III
Environmental Science Center
Fort Meade, MD
(410) 305-2732
Fax: (410) 305-3095

From: Ex. 6 - Personal Privacy
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Subject: RE: Charleston DW GC/MS Data Request

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Principal Research Scientist
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Sent: Friday, February 14, 2014 2:47 PM
To: Ex. 6 - Personal Privacy
Cc: Warner, Sue
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Ex. 6 - Personal Privacy

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Please clarify the instrument type, method used (Drinking water versus SW-846 type protocol), and preservative/quench agent.

Please feel free to contact me for more information or if you have any questions.

Thanks,
Cindy

Cynthia Caporale, Chief
OASQA Laboratory Branch
U.S. EPA Region III
Environmental Science Center
Fort Meade, MD
(410) 305-2732
Fax: (410) 305-3095

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Where: phone

Happy New Year Monthly regional lab director calls for 2014.
Toll Free Call in nu
Conference Code: Ex. 5 - Deliberative

Some of you have asked about video conference capability for our calls I can set this up but you will need to send in your vtc location each month, especially if it changes. Some may need to reserve unit/room several months in advance.

Regional Lab Chief Call Leaders for 2014:

Jan	Region 1
Feb	Region 2
March	Region 3
April	Region 4
May	Region 5
June	Region 6
July	Region 7
Aug	Region 8
Sept	Region 9
Oct	Region 10
Nov	Region 1
Dec	Region 2

If you need any assistance, I can be reached at the following numbers:

202-564-3654 (work)
301-442-5708 (cell)

Sincerely,
Chris Zawlocki

11:00

Warner, Sue

Subject: Fw EPA R3 IMT Environmental Unit-- Technical Call on Charleston WV Chemical Leak
Location: Conf Call

Start: Tue 1/14/2014 8 00 AM
End: Tue 1/14/2014 9 00 AM

Recurrence: Daily
Recurrence Pattern: every day from 8 00 AM to 9 00 AM

Meeting Status: Accepted

Organizer: Casillas, Laura

Ex. 5 - Deliberative

Jack Kelly, OSC

FYI - I wil try to attend and we should plan to meet Monday morning to discuss what support we could offer

Hello Group,

Hope you are well The purpose of this call is to coordinate among EPA groups who are providing support or services or who are ready to provide them for the response above. As you know there are a lot of questions about cleanup numbers, safe numbers, flushing methodologies, timelines, laboratories and methodologies for analysis, sampling plans for water, drinking water. THIS WORKING MEETING IS ONLY INTENDED FOR THOSE PROVIDING OR NEEDING AN EPA SERVICE NOT FOR GENERAL OPERATIONS OR OTHER, PLEASE SHARE ACCORDINGLY.

Our focus is to·

1. Determine was services have already been requested of EPA and by who.
2. Determine what services EPA is ready to provide on this chemical, for who, and by who.
3 Discuss what other needs may be out there (not all of us may have heard of so please share)
4. Develop one clear EPA message on numbers and safety of the water.

Meeting is scheduled at 8am for the next 30 days—we will adjust according to what the group deems necessary.

My goal is to have enough information available from this meeting to provide a clear all inclusive technical strategy (even if it is general) on behalf of EPA by Monday AM

We will have a separate call for overall operations and progress (OPS Brief) by 0900 Monday 1/13 where this strategy can be presented in a unified manner.

Agenda: OSC JACK KELLY has agreed to be our Environmental Unit Lead, I've fallen into planning so I'll facilitate the set up.
Introductions
Report outs (Please address each points under focus above)
Agree on a communication structure for those groups providing a service (meeting daily for now?)
Review Tasks and Responsibilities for follow up
Questions and Additional needs

Food for thought:

Scientists cobble together ad-hoc water limit
http //www wvgazette com/News/201401110061

Ex. 5 - Deliberative